OFFICIAL PUBLICATION OF THE AST



AMERICAN SOCIETY OF TOOL ENGINEERS

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The Tool Engineer

Published monthly by American Society of Tool Engineers

Editorial and Advertising Offices 550 W. Lafayette Blvd. Detroit 26, Michigan

National Headquarters American Society of Tool Engineers 1666 Penobscot Bldg. Detroit 26, Michigan



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August, 1947

Vol. XIX No. 1

It Can't Happen Here

REEDOM FROM FEAR of famine is one of the choicest blessings of life in the United States today. And, as with most truly great blessings, we tend to take it for granted. The word "famine" paints a horrible picture of great suffering before our mind's eye—a picture of something that has happened at some other time, in some other place. We accept our national food supply as a certainty. Famine just can't happen here. But why can't it?

Traditionally we set aside a Thursday each November on which we pause to give thanks for a bountiful harvest which has provided us with food for the winter. Not only on that day, but on every other, we have much more for which to be thankful. It is not just one summer's harvest that insures our food supply. It is the technological progress of the past 75 years which helps increase the bounty of the harvest and which enables us in the "years of plenty" to store up food for the lean years.

Improvements which have transformed farming from a way of life into an industry have made famine-producing crop failures very nearly impossible. They have armed our farmers with scientific weapons for combatting the once inevitable raids of the natural foes. Irrigation, soil conservation, use of fer-tilizers, pest and disease control have resulted in greatly increased productivity. Mechaniza-tion of farm tools has made possible more intensive cultivation with the use of a greatly reduced labor force. These factors, combined with unusually favorable weather, resulted in an increased agricultural yield that was one of the most spectacular of the country's war production achievements. In the five-year period, 1939-1944, farm output shot up 25 per cent, while agricultural employment actually declined and the acreage under cultivation increased only six per cent.

Developments in the fields of handling and transportation are a major reason why famines can't happen here. In history's record of Biblical times, we find that it was not unusual for people in one section of a country to be starving while those in another part of the land, where crops had flourished, had plenty. But there was no means by which the food could be moved in appreciable quantities from the land of plenty into the stricken area. Today, with the railway, motor, water and air transportation facilities available to the American people, famine cannot exist in any part of the country. No section need even be short of one luxury food item for any length of time.

Not only has our improved transportation system made possible equitable food distribution, but it brought about changes in the nation's eating habits which have made us a healthier people. Fresh fruits and vegetables are rushed from truck gardens and farms to rural and urban markets by huge fleets of trucks-and sent over longer distances in the refrigerator cars of fast trains. Low hauling charges and high food production bring a wide variety of foods to the corner grocery of every community at prices within the in-come of nearly every family. Oranges, which were in the Christmas gift class not many years ago, are now a routine item in most American breakfast menus. The 1924 per capita orange consumption of 21 pounds was a peak-but by 1938 the average was 38 pounds. Consumption of the healthful citrus fruit family as a whole increased from 18.2 pounds in 1909 to 62.4 in 1939. Within a decade consumption of fresh asparagus, grapefruit, lettuce, celery and similar produce was doubled.

Easy availability of these and other foods on a year-around basis has resulted in a shift of emphasis in our diets and, consequently, in the quantity of certain food items produced. By 1939 we were eating 14 per cent less carbohydrates, 10 per cent less protein and 5 per cent fewer calories than in 1909. In their place we were consuming more of the so-called "protective" foods—eggs, dairy products, fats, fruits and vegetables—foods made generally available by improved transportation and processing. During this period of change the population increased 45 per cent, but the production of truck crops went up 242 per cent, fruits and nuts 113 per cent and dairy and poultry products, 62 per cent.

Mechanical innovations which provide simple, economical means for processing and packaging foodstuffs have added to the variety on grocery shelves and enabled us to store surplus foods for use when needed. Since the beginning of this century the output of the food manufacturing industry has increased four-fold and nearly three-fourths of the money spent for food buys their products. Important advances in processing are being made constantly. It was only a few years ago that manufacturers began putting tomato juice in cans and bottles. Within a decade consumption had quadrupled and the product had a place on every pantry shelf.

As technological progress has brought oncerare foods into our every day eating, its latest advances have made possible new luxuries for the dinner tables of those who can afford them. Now a Chicago hostess may treat her guests to a tasty creole dish prepared by a famous chef in New Orleans' French Quarter, and rushed to her by plane.

Thus, we are blessed not only with a freedom from fear of hunger, but with the assurance of a good supply of widely varied foods . . . because we live in a land that produces 95 per cent of the food we consume and whose industrial development insures efficient distribution and safe processing for storage.

Famine? - it can't happen here.

W. B. Perrie

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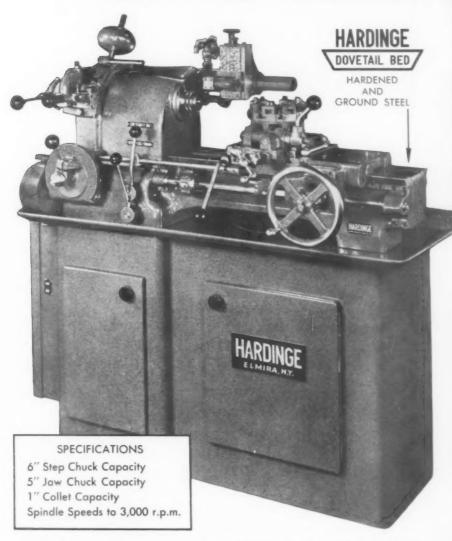
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The Tool Engineer is published monthly at 550 West Lafayette Boulevard, Detroit 26, Michigan in the interest of the members of the American Society of Tool Engineers. Advertising and Editorial departments are located at 550 West Lafayette Boulevard, Detroit 26, Michigan. Subscription is \$2.00 per year. Non-members \$6.00 per year in the U.S. A., Canada \$6.50 per year; all other foreign countries, \$8.00 per year. Copyright 1947 by the American Society of Tool Engineers. Entered as second-class matter July 29, 1947, at the post office at Lansing, Michigan under the Act of March, 1879.



PRECISION Multi-Operation CHUCKING MACHINE



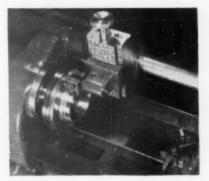
A typical part from rough blank, finished on twelve surfaces (indicated by heavy white lines) and threaded to specified tolerances.



Turning — close-up view showing the part held in a standard step chuck. Threading head withdrawn to give ample space for free turret operation.



Boring — note the simple standard square tool bits; and closeness of turnet to work.



Threading — high speed threading with extreme accuracy because there are no intervening gears.

Here is an example of precision production work easily handled by the new Hardinge Multi-Operation Chucking Machine — in one chucking, twelve surfaces were finished with single point tools to

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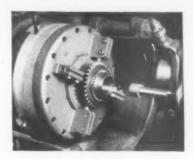
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DIAPHRAGM CHUCK



CONE-LOK JIG

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BCALE DRAWN by REVISION

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TOOL LIFE: 75 pieces per grind. PREVIOUS PRACTICE: NONE, no other tool could MACHINE: Two spindle Excello

do the job.

OPERATION: Finish Bore MATERIAL: S.A.E. 1112 Annealed S.F.M.: 1200 R. P. M.: 2000 MACHINE CYCLE: 43 seconds

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Final Junalysis
Analysis

Carbide **CONCLUSIVELY!**

DATA TEST PERFORMANCE

TOOL

OPERATION:
Machine: Sundstrand Automatic

Machine: Sundstrand
Lathe
Material: N. E. Steel 1340
Material: C scale 39-41
Hardness: C scale 39-42
Dia. of Part: 1.175 -.002
Dia. of Part: 1.175 inches
Length of Cut: 1/32 inch
Depth of Cut: 1/32 inch
R.P.M. 860
R.P.M. 252

NO. DEPT. REFERENCE

TEST ANALYSIS:

No. of pieces per index:

No. of indexes per end:

Total indexes both ends:

Total no. of double end grinds:

Total no. of pieces per life

of carbide:

Flat carbide tools were found to be unsatisfactory because seven hours of set-up time and four hours of grinding time were necessary to produce 50,000 shafts. Solid round carbide inserts (in various grades) were used in Weadock special tools. (See Test Analysis).

RECOMMENDATION: The tests proved conclusively that VR is the RIGHT carbide. VR carbides in various grades. were used in Weadock special tools. (See Test Analysis).

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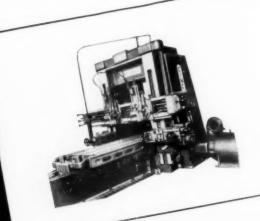
steel Metallurgical Corporation and The Vanadium Alloys Steel Company

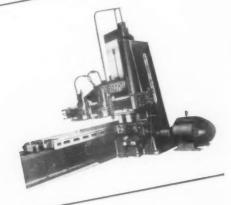
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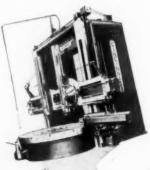
Mill your ??? electronically on our Planer miller

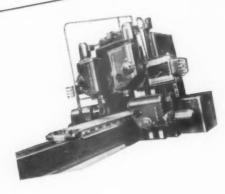
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CHICAGO

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Dodge Plant - Chicago, Illinois,
September 17-26, 1947

Booth Number - 220

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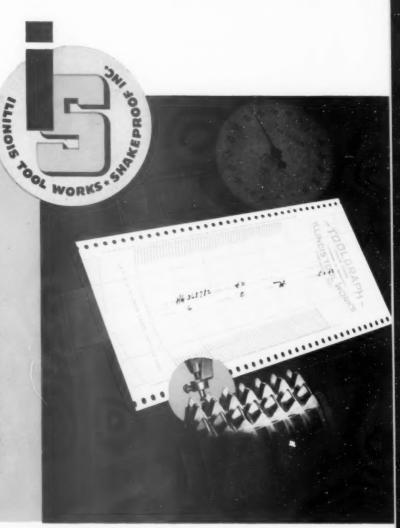
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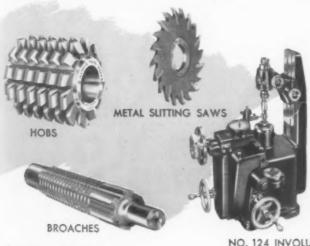
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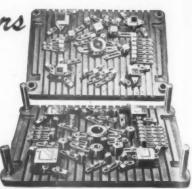
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Tooling Methods for Working Magnesium

By James V. Winkler

In Which the "Know How" of Magnesium Processing Is Discussed by An Authority

PERHAPS MANY OF YOU have not, as yet, had much experience with magnesium, while others have become quite familiar with the metal. For the benefit of those who are not overly versed in this relatively new material, a strict discussion on tooling methods will be deviated from to insert a few remarks of a general nature.

You are all familiar with the fact that sea water is one source of magnesium. Virtually all of the metal being produced today is obtained from this source, which can be considered truly inexhaustible considering that each cubic mile of sea water contains about 9 or 10 billion pounds of magnesium. As years go by, this unlimited source of supply will certainly be a contributing factor toward the ever-increasing use of magnesium, especially so as the high grade ores necessary for economical production of iron and aluminum become depleted.

JAMES V. WINKLER was born in Manitowoc, Wisconsin. He received his high school education in Manistee, Michigan, and was graduated from the University of Michigan in 1941 with a BS degree in Mechanical Engineering.

In July, 1941, he joined the staff of The Dow Chemical Company's Bay City, Michigan, plant, where he was placed in charge of experimental engineering at Dow's magnesium fabrication laboratory. He is now development engineer for magnesium, on the West Coast, as a member of Dow's Los Angeles staff.

Pure magnesium, as is the case with most other pure metals, is soft and possesses low strength. Various alloys of magnesium are therefore used for structural purposes, which, depending on the use for which the alloy is intended, normally contain from 1.5 to 11% of aluminum, manganese, or zinc, either singly or in combination. Through the medium of common usage, the word "magnesium" which is available in the form of sand, permanent mold, and die castings, forgings, extrusions, sheet, and plate—has come to be understood as meaning an alloy of magnesium, and subsequent reference to magnesium alloys will be made accordingly.

You are all familiar with magnesium's outstanding characteristic, its low weight, which is approximately two-thirds that of aluminum and less than onefourth that of steel. This property, combined with its favorable strength characteristics, is the main reason increasing amounts of magnesium are being used wherever lightness is an important consideration.

For sections of the same size, highest strength alloys of aluminum and of steel are stronger and stiffer than the highest strength magnesium alloys. Since the weight of magnesium per unit volume is less than aluminum or steel, however, a deficiency in strength or stiffness can be overcome by increasing the section size.

Magnesium Has High Strength

For example, a rectangular beam loaded in bending can be made of magnesium with a resultant weight saving, because the strength increases as the square of the depth, and the stiffness as the cube, while the weight increases only in direct relationship to the depth. This point is illustrated readily by comparing rectangular beams of equal width having depths such that their weights are equal. The materials used for comparison are X4130 steel having unit depth, 248T aluminum with depth of 2.8, and F8-1h magnesium with depth of 4.4.

When subjected to bending loads and compared on the basis of yield strength, the magnesium is found to be 7½ times as strong as the X4130 steel and 65% stronger than the 24ST aluminum. The same beam is 19 times as stiff as the steel and about 2½ times as stiff as the 24ST. For equal strength a magnesium beam would weigh 36% as much as a steel beam and 79% as much as a 24ST beam.

Magnesium extruded stock coming from the press.



[&]quot;Adopted from an address, by the author, at Los Angeles Chapter, ASTE,

Two misconceptions regarding magnesium, which should be mentioned, concern corrosion resistance and fire hazard. The misconception regarding corrosion has resulted from accelerated tests made on magnesium in salt water immersion and salt spray tests. Magnesium is anodic to most other metals which contact it, or which are included in the metals as impurities, and these tests provide a conducting medium which results in current flow.

This current prevents the formation of protective films that otherwise resist corrosive attack. Exposure to atmosphere, even though it be a salt-laden one as occurs in seacoast regions, does not result in this electrolytic current; therefore, the tests do not represent conditions which occur in the normal use of magnesium.

Fire Hazard Negligible

The point regarding fire hazard is that, before magnesium will burn, it must be heated to its melting point, which ranges from 1100 to 1200° F., depending on the alloy. Small chips and shavings can be heated to the melting point readily; therefore, in machining operations precautions should be taken to employ practices which do not result in excessive production of heat. Good housekeeping should be observed to prevent accumulation of a large amount of chips which might result in serious trouble, should a fire be started due to incorrect observance of machining practice.

As magnesium is a good conductor of heat, practically no danger exists in the processing or use of magnesium parts. Heat introduced at a given point on such a part, as for example by arcing due to a short circuit, is rapidly dissipated. The only danger present is in the rare instances where enough heat may be present to raise the temperature of the entire part above the melting point.

The only exception to this rule is in the heat treatment of castings, where the long times used in the heat treatment may cause a low melting point eutectic mixture to bleed to the surface, which may result in burn-

Extruding magnesium.



ing at a temperature somewhat below the melting point of the base material.

The remaining portion of this discussion will be concerned with the fundamental aspects of forming magnesium sheet and extrusions.

The same fabricating equipment is used in forming magnesium as in forming other common metals. The main difference in tooling and methods arises from the use of heat to permit ready deformation. While forming metal in the heated state does seem to pose problems which tax the ingenuity of the tool designer, the advantages to be gained through the use of heat are appreciable.

Heat permits parts to be formed in fewer operations, it reduces springback, reduces the load on the forming equipment, results in elongation which permits parts to be stretched beyond that of other metals at room temperature, and it is possible to correct part size by adjusting the temperature at which a draw die is operated.

None of the magnesium sheet materials require heat treatment after forming. Sheet in the annealed temper may be heated to temperatures up to 700° F, without affecting inherent metal properties. High strength sheet, which is usually used in highly stressed applications which do not require extensive forming, is made by cold working the sheet in the rolling mill. In using this material, forming temperatures are limited to prevent annealing which would result in strength loss.

Both hydraulic presses and mechanical presses are used for drawing magnesium sheet. Hydraulic or pneumatic means of applying pressure to the blank retaining portion of the die is essential where maximum draws are required. Single action presses are sometimes used for hot drawing magnesium by employing springs or "C" clamps to restrain the sheet in the blank holder. Control of clamping pressure is inferior, but the equipment is adequate where moderate draws are to be made or when the number of parts required is small.

Stress Relieving Important

Materials for hot forming dies obviously must be able to withstand temperatures employed in the drawing operation without ill effect. Pressure rings and draw rings are usually made of mild steel. It is important to stress relieve the steel before finish machining to remove strains which would warp the die after it was placed in service. Meechanite cast iron and gray cast iron are also used, the former having the advantage of better size stability where large production is involved. Steel, cast iron, aluminum, and magnesium are used in making punches.

In designing dies from materials having a different co-efficient of thermal expansion than magnesium, allowance must be made to obtain accurate part dimensions. Steel and cast iron die parts should be increased in size .0008" per inch for each 100° F, the die is operated above room temperature.

The entering radius on the draw ring or female die should be from five to seven times the thickness of the sheet being worked for maximum drawability.

When only a small number of parts are required, dies can be heated by means of a hand torch or by placing them in ovens. In this case, temperature can be checked by means of a contact pyrometer. For production work, however, dies are heated by means of electricity or gas, and temperature control is exercised by automatic instruments.

Electric cartridge heaters, inserted in holes drilled in the die, and strip heaters clamped to the die surface, are employed on small dies or on large dies where an open gas flame is undesirable and the increased cost is therefore warranted. Temperature control is maintained by means of a controlling pyrometer which operates a magnetic contactor.

When gas heating is employed, the gas and compressed air is mixed by means of suitable equipment and conveyed to the die burners by means of rubber hose. The die burners are made of %" or 1" steel pipe bent to shape as required. Burner ports in the pipe are #40 drilled holes spaced about ½" apart. The burner is mounted 5%" from the die so the flame impinges on the surface to be heated.

Control is obtained by means of a controlling pyrometer which regulates the amount of gas burned by operating a solenoid valve. Gas burners should be so located that the magnesium sheet will not be subjected to an open gas flame, which might cause hot shortness or grain growth.

Graphite for Lubrication

Two types of ovens are used for bringing the sheet to temperature before it is placed in a die. A contact plate heater, in which the sheet is pressed between two steel or cast iron plates heated with electric strip heaters, is preferred for flat sheet. Standard air ovens are also used for flat sheet, although the operation is slowed by a waiting period required to bring a new stack of sheet up to temperature. The latter type oven obviously must be used where more than one operation is required in forming a part.

While standard type oil lubricants are satisfactory for low temperatures, lubrication of sheet to be hot formed above 500° F. is accomplished by graphite. The most commonly used material is a colloidal graphite suspended in a volatile carrier. This material is sprayed on the sheet and the carrier evaporates, leaving a thin film of graphite, which clings tenaciously to the sheet. This coating prevents scoring of the sheet being formed and stays on the sheet during the drawing operation so the die is not fouled.

The temperature to which a sheet must be raised to provide sufficient ductility for forming depends on a number of factors. The alloy and temper of the sheet must be considered. As mentioned before, use of hard rolled sheet is limited to parts in which a moderate amount of shaping is required, as the forming temperature must be limited to prevent excessive property loss through annealing.

The maximum temperatures used on hard rolled sheet vary from 275° F. to 400° F., depending on the alloy. Somewhat higher temperatures are permitted where the operation permits the forming to be completed rapidly so the sheet is heated a minimum length of time. Temperatures ranging from 450 to 700° F. permit very deep draws in annealed sheet. For example, shells having a depth 3 times the diameter have been made successfully under carefully controlled conditions.

The shape of the part often dictates the temperature requirement, especially in the case of the punch. On ordinary draw work a punch will absorb sufficient heat from gas burners on the draw ring and pressure pad. Where the sheet must be stretched sufficiently to allow it to shape to the punch, as is the case with a part such as a hemisphere, the punch must be heated so the sheet can be kept hot enough during the operation to preclude puckering.

When maximum depth draws are required, the punch is sometimes cooled by means of water to a temperature of 150 to 200° F. This permits the sheet between the holding plates to be heated high enough so it can be plastically compressed without forming wrinkles, while the sheet drawn over the die radius is cooled by contact with the punch so its strength is raised to permit drawing the sheet from between the plates.

Flanged parts, lightly contoured parts, and other shapes which do not require drawing action may be formed in rubber. Labor cost is higher; but where a small quantity of parts is required, the advantage of low die cost and speed of producing or revising dies offsets this disadvantage.

Form blocks are made from aluminum or magnesium either machined from plate or castings.

Rubber forming is usually conducted at temperatures of 300 to 450° F. Specially compounded heat resistant natural rubber or synthetic rubber, which will stand temperatures developed in using dies at 450° F., is employed either as a facing on a natural rubber pad or in making up the entire pad.

The usual method of providing heat is by means of an oven. The blank is placed on a form block and brought up to forming temperature in the oven and then transferred to the press for forming.

While the drop hammer has not been used extensively for forming magnesium, recent experience has proven the process economical and suitable for producing shapes as complicated as produced in most other metals.

Zinc base alloys having melting points of 700 to 725° F. normally used in making drop hammer dies have proven satisfactory for forming at temperatures as high as 450° F. Antimonial lead, usually used as a punch, has been used at temperatures up to 350° F.

The dies must be heated, as hot sheet would be chilled too rapidly otherwise to permit forming. Heating is accomplished by means of a hand torch or by pipe burners mounted on the sides of the die. Sheet is preheated in an air oven prior to each operation.

Grips Must Be Smooth

Stretch forming of magnesium sheet, particularly in the hard rolled condition, is limited at room temperature. Large elongation obtained in heated sheet, however, permits the stretching of very complex shapes.

Grips for clamping the sheet should be relatively smooth. If a machine has sharp serrated grips which

Extruding magnesium.





Various types of magnesium extrusions.

result in the sheet's tearing, the trouble can be overcome by lining the grips with emery cloth.

Punches for hot stretch forming can be made from a zinc base alloy if the temperature is limited to 450° F. Aluminum or magnesium castings are used at higher temperatures. The punch is heated by means of gas or electric cartridge heaters and the sheet is heated by contact with the punch. Graphite-tallow mixtures are most satisfactory for punch lubrication, as they provide adequate body to eliminate slip chatter.

The spinning process for magnesium has proven very successful. Small quantities are produced at an appreciable saving due to the lower tooling cost. Where the shape of a part is such that press tooling would be very complex, spinning may be employed to advantage for even a large quantity of parts. Spinning at room temperature is limited to shallow parts which do not require small radius bends. Heating the sheet, however, permits it to be formed as readily as any other commonly spun material.

Heat is normally applied by means of a torch which is played in the rotating part. The spinner can regu-

late the heat applied by the "feel" of the material. An excellent means of checking temperatures is by the use of temperature indicating crayons, which make a chalk-like mark, or a liquid smear, depending on whether the part is below or above the rated temperature of the crayon.

The advantage of the crayon over a contact pyrometer is that the temperature check can be made while the part is rotating. Chucks for spinning are made of maple or of metal. Maple chucks are satisfactory for a small number of parts. Metal chucks may be heated by playing a gas flame on the base of the chuck and thus reduce or eliminate the necessity of using a torch.

The spindle speed should be so selected that the peripheral speed of the outside of the blank will be about 2,000 feet per minute. Standard spinning tools are satisfactory. Lubrication is usually obtained by use of brown laundry soap or a paraffin-tallow mixture. In some cases, where high temperatures are required, a graphite-tallow mixture is employed.

An extrusion may be formed by clamping one end and bending it to a form block by hand or with a soft hammer. If heat is required, a hand torch is played on the extrusion while the bending is in progress. Use of heat, in addition to permitting smaller bends, reduces the force required to make the bend and reduces the springback. The latter effect is a very definite advantage where the extrusion must conform to a form block or where a bend through 360° is required.

Angle rolls, mating dies, stretch forming presses, and specialized bending machines are employed where production quantities are required. Heating when necessary is accomplished by placing the stock in an oven. Dies are heated by placing electric elements in the dies or attaching gas burners in such a manner that the flame may be directed against the die.

It is hoped that this discussion has been of assistance in obtaining a better picture of tooling methods utilized to work magnesium. The attention of experienced personnel, such as represented by the tool engineers, to the tooling problems encountered will undoubtedly develop improved techniques which will facilitate utilizing magnesium in ever increasing amounts.

Ground Flat Stock by Starrett

Two types of precision ground flat stock—Oil Hardening and Water Hardening—produced by the L.S. Starrett Company, Athol, Mass., are now available through the company's distributors. The Oil Hardening is a non-deforming, electric furnace tool steel, fully spherodized annealed with fine grain structure and deep hardening characteristics for precision parts requiring accuracy of size after hardening. The Water Hardening is a high grade tool steel specially made and annealed for easy machining which develops maximum hardness when quenched in water or brine.

By saving the time of skilled craftsmen by eliminating all preliminary roughing and grinding prior to machining, flat stock of this type expedites production of precision parts for dies, flat gages, drill jigs and templates, and flxture and other small parts having two flat parallel surfaces. The steel is supplied in pieces 18" long and ranges in width from $\frac{1}{2}$ " to 6" and in thickness from $\frac{1}{16}$ " to 1".

The two flat sides are precision ground parallel, straight and to a tolerance of .001". The ends are machined square and the edges ground parallel and square to the sides. Each piece is machined for size and type, and is protected from rusting and scratching by an envelope on which the size, thickness and heat treating instructions are clearly indicated.

\$1,000,000 for Education

As recently announced by W. W. Trench, secretary and chairman of the General Electric Education Committee, G-E will spend \$1,000,000 during 1947 for employee education. Now over 60 years old, the G-E educational program already has a "student body" larger than many a college or university. More than 12,000 employees and 500 instructors participate in courses ranging from apprentice training to scientific subjects. Through some of the most advanced technical courses, employees are enabled to obtain education practically tantamount to that required for a doctor's degree.



Grinding Spur and Helical Gear Teeth

Story of Progress from Ancient Times When Gears were Made of Wood, With an Emphasis on Present Day Gear Grinding Methods and Machines

Were in existence; and, while they were merely wheels with pegs in their periphery, they, like the gears of today, were used to transmit motion. The 13th century clock used gears made of wood. As a matter of fact, up to the 19th century practically all gears were made of wood. The epicycloid was discovered in 1793 and the involute, some 25 or 30 years later. Metal gears came into being in the 19th century, but they were mostly cast gears.



John C. Dixon has had many years of experience as tool and machine designer, having specialized on gear tool development. After several years employment with the New Departure Mfg Co., the Watervliet Arsenal, and United Shoe Machinery Corp'n, he joined Pratt & Whitney, Div'n

Niles-Bement-Pond Co. where, for the past several years, he has served as Equipment Engineer. In 1943, added duties included service with the W.P.B. as consultant on gear problems.

One of the first machines used to finish gear teeth was a grinder. This grinder, made in England and in use before hobbing methods were discovered in 1856, consisted of a vertical slide carrying a handformed grinding wheel. The slide was reciprocated by a crank and the work was mounted on a vertical arbor. The work acted as an index wheel, and the grinding wheel removed the casting blemishes and smoothed the gear teeth.

The last half of the 19th century saw gear cutting machines developed, and before the turn of the 20th century hobbing machines came into use, also shapers—as the

FIG. 1.



Fellows—for spur gears, and the Gleason generator for bevel gears.

Along about this time the automobile was making its appearance and, from a research as well as an advertising standpoint, it was an interesting era, with many road races being run in various sections of the country, and with the keenest of competition.

Ground Tooth Gears for Racing Cars

Timing gears and transmission gears were first singled out as extremely important elements in these racing cars. Gears were heat treated and some had ground teeth. A few of the early higher-class stock cars, with ground tooth gears, included Duesenberg, Locomobile and Pierce. These gears were furnished by Pratt & Whitney, one of the few organizations then equipped to grind involute gears.

About 1920, the geared head lathe had been in existence for a short time and, being subjected to severe criticism because of its lack of smoothness in spindle drive, it became evident that ground gear headstocks must be used. As time went on, more power for machine tools was demanded and, in order to keep the size of the machines down to a minimum, it was necessary to harden the gears and grind their teeth. The present high powered, high speed machine tools designed for carbide tools would require a greatly increased floor space were it not for the fact that hardened alloy steel gears were used.

The production of automobiles increased through the years; but about 1930, the buying public started getting particular about noise, comfort, speed and cost. As a result, greatly improved cars came into existence, and many of them featured ground gear transmission. Motor trucks with their high powered engines, diesel powered plants for marine and railroad use, and torpedo mechanisms and turbines also began using more and more ground gears. The 1930's also saw aircraft production come into its own, and here the gear tooth grinding machine furnished a major contribution.

FIG. 2.



Thus, we see that ground tooth gears have played a major part in automobile, aircraft, marine, machine tool, torpedo and turbine manufacture. Now, let us examine the reasons why.

Physical Properties

Use of hardened steel gears, with their increased physical properties, has permitted the designer to use gears of narrow face, fine pitch and lighter construction. This has resulted in gear trains capable of transmitting much greater power, without increasing the size of the gear box necessary to house them. It is easy to imagine how much larger our modern machines would be if soft steel or cast iron gears were still used, and how much more floor space would be required to accommodate them.

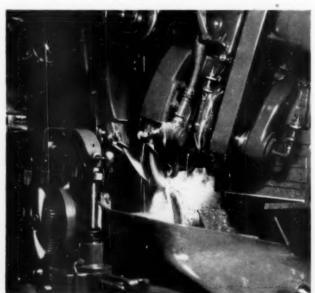
The aircraft engine, with its requirements of minimum weight per horsepower, has necessitated gears of extremely light construction and, in order to use such gears, hardened alloy steels had to be employed to obtain the necessary physical properties.

Accuracy and Finish

While hardened steels take care of the physical properties required, this, in itself, is not sufficient. It is necessary to uniformly distribute the load on the gear teeth, and this requires removing inaccuracies in cutting and distortion due to heat treatment. We believe the elimination of errors can best be accomplished by grinding the gear tooth profile. The accuracy of tooth spacing and profile which is produced by grinding makes for smoother operation, produces gears which are much quieter running, and also permits use of high tooth speeds.

Since the Lewis paper on strength of gear teeth (which included gear tooth forms as a factor in the strength formula) was prepared in 1892, much has been written on the subject. The A.S.M.E. committee on the strength of gear teeth went so far as to develop a test machine, and in its reports the committee included findings as to the effect of tooth form and spacing accuracy on dynamic loads. These tests have shown conclusively that accuracy has a marked effect on the load carrying ability of gear teeth, and that errors of as little as a few ten-thousandths difference, from tooth to tooth, result in enormous load carrying losses.

The effect of accuracy of gear teeth on noise has also been given intensive study, and writings on the subject have appeared in various trade and technical papers. In the February 7, 1938, issue of "Steel," for example, S. O. Bjornberg, Consulting Engineer, Illinois Tool Works, Chi-



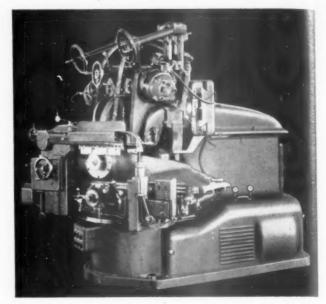


FIG. 3.

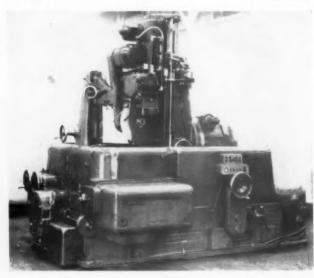
cago, pointed out that accuracy in gear teeth is the real answer to quietness. Mr. Bjornberg further stated that when a pair of gears are ground accurately, they run more quietly under actual operating conditions, than any other class of gear; and when noise does occur, the trouble can generally be traced to the design of the gear bearings and housing.

Quiet, smooth-running gears which can transmit heavy loads uniformly, and without excessive stresses in any of the teeth, must be very accurately finished, both as to tooth form and tooth spacing. Errors as small as .0005" may, under certain conditions, increase the stresses in a single tooth as much as 100%c, and noisy gearing can be caused by even smaller errors.

Gear authorities seem to agree that errors in tooth form or spacing should not exceed .0002", for best results. The gain from closer accuracy is very little, but the loss from errors exceeding .0002" increases rapidly. There is a very pronounced difference in the running qualities of gears accurate to .0002" and those accurate to .0005".

The best method of achieving this degree of accuracy in the finished gear depends very largely on the kind of steel and the heat treatment. For instance, very accurate gears can be produced by "shaving," but the hardness of steel which can be "shaved" is limited. Lapping is also capable

FIG. 4, LEFT. FIG. 5, BELOW.



The Tool Engineer

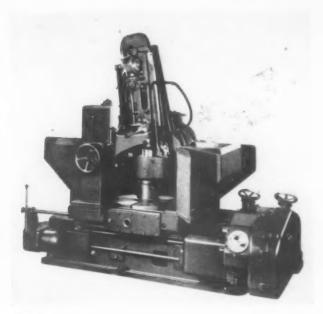


FIG. 6

of correcting errors, but the magnitude of the error which can be corrected by this method is very limited. Where hardened steels are involved, grinding seems to be the practical method of finishing gears to the required degree of accuracy.

It would probably be well to quote from an article by P. S. Brown and Earl V. Farrer, which appeared in the November, 1942, issue of "Machinery." We quote as follows:

"Some of the Manufacturing Problems in Producing Aircraft Gearing. The nature of aircraft gears makes it necessary to use manufacturing methods that differ from the accepted practice. In the case of automotive gears, freedom from noise is of paramount importance, and therefore, helical gears are in most universal use. To eliminate noise and simplify manufacture, the body of many automotive gears is a solid heavy disk. In aircraft engines noise is not of great importance because exhaust and propeller noises far exceed gear noises in intensity, and emphasis is placed on performance and reliability, with a minimum of weight. Plain spur gears are, therefore, the accepted type for use in aircraft engines.

"Because of the high speed at which these gears generally operate, the element of accuracy of the involute form, the pitch, and the concentricity are of extreme importance. Distortion during heat-treatment has been the greatest manufacturing problem. Aircraft weight restrictions and compact design requirements result in gear blanks of such section and form that the least variation in size, steel, or furnace temperature produces warpage. Many experiments with heat-treating methods and equipment did not make it possible to completely eliminate distortion, and it was found necessary to correct the gear teeth after hardening. The most generally used process is grinding. Approximately 80 per cent of all aircraft engine gears are finish-ground.

"Finishing Operations on Gears. Finish is an important consideration in highly loaded gears. All tooth surfaces must be free from cutter or wheel marks and blend with the adjoining surfaces without a sharp edge. A particular advantage of gear grinding is the possibility of obtaining a fine tooth finish at the root fillet, where the bending stresses are the greatest. This is especially true of pinions where the cutters or hobs produce generating ridges, which might be the source of possible tooth failure.

"Cost. Both generating and formed-wheel type grinders are used. The over-all cost compares favorably with that of unground gears, when all operations required to produce similar gears by other methods are considered. The Wright Aeronautical Corporation was among the first producers to employ gear grinding as a high-production method. Gears that are to be finishground-need not be prepared so accurately as those to be finished by some other method, but it is important that all operations prior to finish-grinding be sufficiently accurate so that substantially uniform stock will be removed in the final operation." (End of quote.)

Grinding Tooth Profiles

When we grind the tooth profiles we find that (1) it is no longer necessary to spend the time required to accurately cut or hob the gear—the finish cut can be eliminated; (2) that it is no longer necessary to use non-deforming steels or specialized heat treatment to eliminate distortion; and, that (3) trouble on the test stand is practically eliminated. Expensive disassembly and reassembly of the gear box with its consequent delays is not experienced.

The three savings just enumerated cover, generally, the cost of gear tooth grinding. As a matter of fact, we are told by leading machine tool manufacturers that their present ground tooth gears cost less than their previously unground tooth gears.

Machines Used

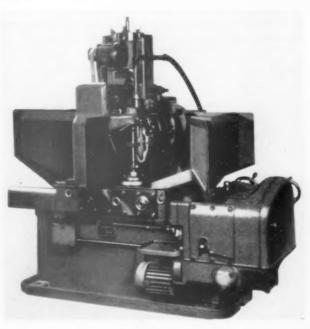
Two different types of tooth grinding machines are now being manufactured. These are: (1) the generating type, and (2) the form wheel type. In the generating type field, several different methods are used to produce the tooth profile. A brief description of several different machines follows:

The Pratt & Whitney single wheel type machines, for gears up to 10" diameter and 6" face, embody a horizontal reciprocating grinding wheel head and a work holding table. The table, which is operated hydraulically, actuates the work through a master gear and rack, to generate the involute. The master gear acts as the index.

Fig. 1 shows the Spur Gear Type machine; and Fig. 2 shows the Universal Type, which is suitable for grinding either spur or helical gears.

Figs. 3 and 4 show a Pratt & Whitney Two-wheel Gear Grinder. This is similar to the machine shown as Fig. 2

FIG. 7.



except for the wheel head, which does not reciprocate and which carries two, 20" wheels. The index and profile is brought about by a master gear and rack. The maximum diameter gear is 10" and the maximum face is 1".

Fig. 5 is a Pratt & Whitney 26" Gear Grinder, with a vertical ram which, in turn, carries the wheel head. The involute is obtained by change gears and a screw, and the index by change gears and a worm and worm wheel. This machine will take up to 26" gears with full size 20" wheel, or 30" with a smaller wheel. The maximum ram stroke is 18". Spur or helical gears up to 30° R.H. or 40° L.H. helix as coarse as 2 P. can be ground. The machine drive is hydraulic except for wheel rotation and wheel dresser.

Figs. 6 and 7 show the Deutsch Niles machine. This machine was made in several sizes and was suitable for spur or helical gears. The means of generating the involute was a worm and worm wheel, and an index device was provided for spacing.

Figs. 8 and 9 show the Lees-Bradner 2 H.S. Spur and Helical Gear Grinder. This is a master rack and gear type of generating gear grinder, using a non-reciprocating type wheel head with two, 30" wheels. The flat side of these wheels are used to grind the gear teeth. Gears having faces $2\frac{1}{2}$ " dependent on pitch can be ground.

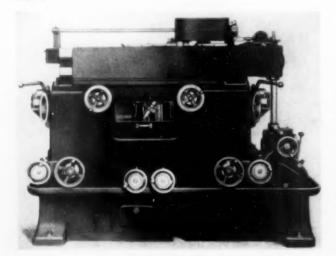
Fig. 10 shows a Maag Gear Grinder. This is a two-wheel type of grinder that uses a pitch drum to produce the involute, and an electrically controlled index mechanism for spacing. The work is mounted on a table that travels under the wheel as the gear oscillates. The wheels grind on the flat side, and are set at a constant angle. Various pressure angles are produced by modifying the pitch drum used. The machine is suitable for spur or helical gears.

Fig. 11 shows a form wheel grinder made by Orcutt of Birmingham, England. This machine is made in several sizes. The wheel head ram reciprocates, carrying a wheel formed by diamonds contacting templates. The involute is formed by the wheel, and spacing is taken care of by an index plate.

Internal Gear Grinding

Fig. 12 shows a Detroit Formwheel grinder for internal gear grinding. The wheel head is reciprocated hydraulically, and the formed wheel produces the involute. The spacing is by index plate.

Figs. 13 and 14 show a Detroit Form Wheel Grinder for external gears. The work is mounted between a headstock and tailstock. The headstock end carries the index plate used for spacing. The wheel slide reciprocates through hydraulic power carrying the formed wheel through the gear tooth to produce the involute. The truing device is



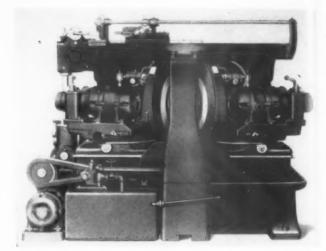


FIG. 9

on the left, and the wheel dressing is by power. The wheel slide automatically goes to a dressing position after a predetermined number of grinding strokes.

Preparation of Gears for Tooth Grinding

There are two schools of thought regarding the preparation of gears for tooth grinding. First. just rough hob or cut a gear, and then harden it and follow by the grinding operation. The latter operation is left to take care of all inaccuracy of cutting and heat treat distortion and, because of this, stock upwards to .010" per side of tooth may have to be removed. Such gears, when finished, sometimes lack a universal case hardness although, where gears are not too heavily loaded, this is of little importance. This method represents the cheapest way to produce accurate, hardened gear teeth and, to the small manufacturer lacking the facilities available to larger organizations, it is the only practical solution to the problem.

Secondly, some manufacturers machine their gears closer to finish size, then shave for accuracy of contour and follow by heat treatment and grinding for final finish and accuracy. This procedure makes it necessary to remove only .003" stock per side, and permits the gears to be much heavier loaded. This method requires special heat treatment facilities, and quenching dies.

The sequence of operations for the ground tooth gear should be arranged to provide proper surfaces for locating and holding the gear during the tooth grinding. For example, gears to be mounted on arbors should have the bore ground to a uniform size, and the locating surfaces must be in correct relation with the bore. On gears that are bushed, such as idler gears, the bushing should be in place and properly bored, while gears having external mounting requirements should be uniformly ground on their bearing diameters. Gears which are to be ground by mounting them on centers must be provided with centers of ample bearing or support dimensions. It is a well established fact that a machine is no better than the tools used on it; and it is, therefore, essential that we consider the accessories necessary for good workmanship.

Work Holding Means

Different design of machines have different provisions for mounting the work to be ground. Some mount the work in a vertical, others in a horizontal plane between centers; still others have a collet arrangement with, and without a steady rest to support the opposite end. Irrespective of how the work is mounted, however, the Tool Engineer must provide adequate work holding means for the various designs of gears having teeth to be ground. The design of a few of the more generally used means will now be described.

FIG. 8



integral on shafts can either be mounted on centers (if such centers are available) or mounted on the shaft bearings.

When cylindrical plug bearing arbors are used, it is obvious that the diameter of the arbor should fit the gear as snugly as possible without mechanical force; and provision should be made to clamp the gear on the arbor without distorting it. Fig. 15 shows an arbor. Note that the gear is placed on the arbor locating one face against an arbor shoulder, which must be square with the bearing plug.

The arbor centers must be as true with the bearing plug as is possible to manufacture, to obtain the best results; and the center should be free from mutilation or dirt, and of ample proportion to carry the load imposed. The driving dog, which is used to connect the arbor assembly to the involute generating mechanism in generating type machines, or to the index head on form wheel type machines, must be locked without distorting the assembly. On machines which have a collet for a driving means, the dog is omitted and the end of the arbor is held in the collet.

Mounting More Than One Gear on Arbor

Where production is high and the gear face and hub dimensions permit, more than one gear can be mounted on an arbor. The permissible number is dependent on the design of the gear and the grinding length capacity of the machine. While this saves index time and overrun, it requires more care in lining up gear teeth before grinding.

Figs. 16 and 17 show a spline arbor which locates on the involute splines. With this type of arbor the splines should be true with the centers. The same type of clamping and dogging is generally used as on plug type arbors. Solid spline arbors offer problems of manufacture of both arbor and workpiece due to backlash; however, there is on the market a spline arbor designed to take care of this condition. Fig. 18 shows the type of arbor or adapter used when gears must be located on an external bearing. Here, it is required that the internal bore of the adapter be true with the centers.

Fig. 19 shows the work mounted on a split bushing, which in turn is mounted on a taper arbor. The only justification for such a work mounting is extremely low production requirements such as might be encountered in a job shop, or where one or two gears of a kind are being ground. When

using a split bushing arrangement, the operator should carefully indicate the gear so that it will run true on centers.

Fig. 20 shows a gear which is cut integral with a centered shaft. On applications such as this, the driving dog is applied directly to the shaft, and the centers in the shaft must be in good physical condition, free from mutilation. Too much cannot be said about the care of centers in the machines and the work. Care must be given to see that they are kept in first class condition. More work appears to be spoiled while being ground, due to bad centers, than for any other single reason. This is true of all types of center ground work.

Fig. 21 shows a type of work locating fixture which assures that the driving dog is mounted in proper relation to the tooth space. After the first gear in the lot is ground and before it is removed from the arbor, the arbor assembly is mounted between centers in the fixtures, the tapered locating pins are placed in the tooth space centralizing it, and the dog locator is adjusted so as to contact the same face on the dog as the positive side of the work driver in the machine. In this way, each arbor has the driving dog in the correct position on the arbor to bring the tooth space in the gear into proper relation with the grinding wheel on the machine. As a rule, arbors are furnished in duplicate to permit the operator to load one, while the other is in the machine.

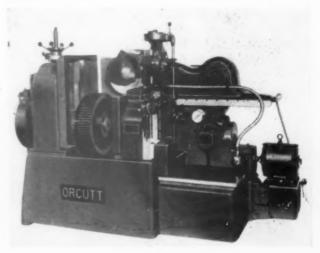
The illustrations of work holding devices shown are relatively simple ones. There are instances where very elaborate work holders are a necessity; but, so far, the Tool Engineer has always managed somehow to design equipment to meet the requirements.

Diamonds and Truing Devices

All machines are equipped with diamond truing devices. Some of these are hand operated, others power operated, either electrically or hydraulically. Some of these devices are designed to permit either manual or power dressing, the latter having the advantage of controlled speed for both rough and finish dressing. Some of these devices form the wheels to the equivalent of a straight sided rack, such as used on generating type machines; others dress the wheel to a flat side on generating machines where the pressure angle is obtained by adjusting the wheel head, while on the form wheel type machines the complete form of the wheel has to be dressed to agree with the involute to be ground.

Diamonds used, range in size from ½ to ¾ carat and are generally octahedron in form, with either sharp points, or with flat points up to .008" across. They should be mounted to permit turning the holder, thus preventing excessive flats to develop on the cutting surface. Excessive flats, on the diamond cutting surface, will affect the form being produced on curved surfaces.

FIG. 11.



A slow diamond traverse, and a light feed should be used on the wheel before grinding a finish pass. A somewhat faster traverse, with slightly deeper feed, can be used to make the wheel more free cutting. One should never, at any time, take deep diamond feed in rapid traverse. This makes a rough surface on the wheel, causes excessive diamond wear, and the wheel will not grind uniformly.

If there is one item on gear grinding where special instructions should be given to an operator, it is on the use of diamonds for wheel truing. If the operator is careless, he can very quickly ruin the diamonds and get resultingly poor work. This is particularly true where manually controlled devices are used.

Don't shut off the coolant when dressing a wheel. Dry dressing will result in an excessive distribution of spent abrasive over the machine, which causes wear and, in addition to this, the heat generated may cause the diamonds to crack. Finally, bear in mind that the cheapest diamonds are not the best; rather, the best are the cheapest to use.

Grinding Wheels

Generally speaking, aluminum oxide is used as the abrasive, although silicon carbide has been used with some success on nitralloy gears. We find that aluminum oxide the equivalent of Norton 38 or 57, or Carborundum AA or GA can be efficaciously used for generating grinding. For form grinding machines, the same abrasive is also used, although regular aluminum oxide has been successfully tried on certain form grinding machines. The regular abrasive is somewhat less expensive than the refined.

Vitrified bonded wheels are used on both form and generating machines. This type of bond gives a wheel stiffness which is important on thin wheels, particularly those of large diameter. Wheels, with this bond, are readily dressed by diamonds without excessive diamond wear. Some of the very small diameter wheels used on form grinders have had a resinoid bond, but the use of such a bond on gear grinding wheels has been limited, except on bevel gear grinding machines.

On generating type, single wheel machines, the new 54 grit is used for regular types of work, and 60 grit for finer finishes. On the two-wheel generating machines, both 54 grit and 80 grit are used. Grits finer than 80 have been found unfit because of their inability to cut readily.

On form grinding machines, 46 and 54 grit are the choice. Grits from 46 to 80 in grinding wheels will give surface finishes from 20 to 40 microinches. Microinch finishes less than 20, present conditions where metal to metal contacts begin to occur. This causes scuffing on highly loaded gears. On gears carrying light loads, micro finishes finer than 20 can be used, and the gears can operate successfully.

Grades of grinding wheels vary with the material being ground, the coolant used, and the type of cut taken. On

FIG. 13.

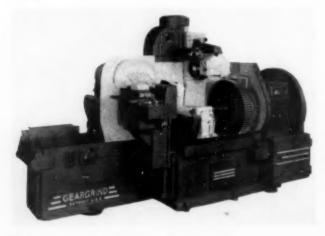




FIG. 12.

generating type, single wheel machines grades K, L and M are used, K being the more popular; M grade wheels are only used with an oil coolant. On the form wheel grinding machine, I and J are used. On two-wheel grinding machines, of the generating type, grades II and I are regularly used with an occasional use of grade J.

While the foregoing may be of help in selecting wheels for the gear tooth grinding operation, they are certainly not offered as the last word. They are merely suggestions on wheels that have been tried and used successfully by gear makers, and they should only serve as a fair starting point for selection. Slotted and segmental type of grinding wheels were tried but were given up as impractical. The slotted wheels were subject to springing, and were found to be unsuited to the machines of the generating type, while the segments required expensive moulds and wheel mounts that increased rather than reduced the cost of this type of wheel.

Coolants

Because of close tolerance requirements and the necessity of fine finish, the majority of gears have their teeth ground with a coolant being used. Two types of coolants are utilized: either a water compound, or a so-called grinding oil. A water compound, consisting of from 80 to 100 parts water to one part soluble oil, was the first coolant used.

On work that does not readily heat-check or develop skin softness, a water compound is preferred as it is less messy and affords a greater degree of operator comfort than oil coolants. At the present time, a majority of ground gears used in the machine tool industry are ground with a water compound coolant.

Aircraft gears, and certain super-hard gears for use in special applications are generally ground using an oil coolant. On such gears, a skin softness, or so-called grinding check, sometimes develops and, in order to eliminate this condition, straight grinding oils have come into use. It is found that the lubricating qualities of oils tend to reduce wheel loading and to keep it clean.

The fact that the wheel is kept clean means less dressing

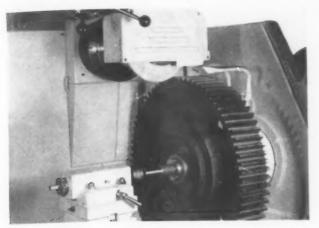
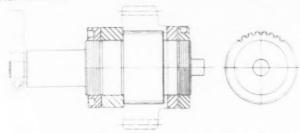


FIG. 14. ABOVE

FIG. 16, BELOW.



and permits finer grits and harder grade wheels to be used. Generally speaking, one, to two grades harder gives satisfactory results and much longer wheel life. Clean wheels, resulting from an oil coolant, mean less pressure on the work to remove stock.

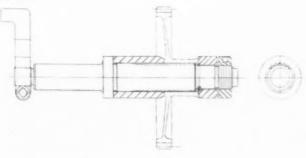
Oil vs. Water

Oil does not carry off heat as readily as water; however, if proper selection is made, the oil will get to the source of the heat generation, and minimize it far better than water. This accounts for the fact that a piece which has been ground with a water compound may feel cooler to the touch than a piece ground with oil; but, on closer examination it may be found that the piece cooled by the water compound may have heat checks whereas the oil cooled piece will not.

The oils generally used are of low viscosity for the purpose of "wetting" and, generally speaking, they are natural oils treated with chemicals. They usually have a high flash point to eliminate combustion and all are treated to eliminate skin disorders. As a matter of fact, a great many of the skin disorders attributed to grinding oil have been found to result from washing workpieces in kerosene or other solvents, after an operation, rather than to the grinding oils themselves.

The major objection to oil as a coolant, is the fact that it can be messy and requires more care in its application to the work. High volume, without pressure, will minimize spray and for this reason large orifice nozzles designed for a specific job are required.





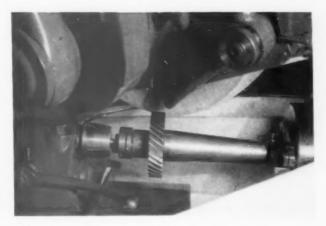


FIG. 15.

Grinding, with the work submerged, has also been a successful method of reducing spray. This is brought about by pumping the coolant into a receptacle surrounding the gear to be ground. As long as the coolant is pumped into the receptacle faster than it flows out a suitable level is maintained and good results are obtained without too much attention being given to the design of the receptacle.

A coolant oil should come from a tank of ample dimension, and it is preferable that the tank be equipped with baffles so that the chips and sediment can settle. Periodic cleaning of the tanks is an important requirement. It might be pointed out that the same pump used for pumping a water compound might not be satisfactory for pumping a grinding oil. Also, a larger capacity pump will probably be necessary when grinding oil is used.

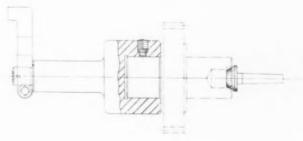
Filters for coolant have been developed, and many types are now on the market. Coolant filters are not, as a rule, built into gear grinding machines. Exhaust systems or spray eliminating appliances have also been put upon the market, and many of these have a considerable amount of merit. The Westinghouse Precipitron, which is a high voltage unit, has been used with very fine results. Individual machine applications, as well as group machine applications can be obtained.

Production

The production obtainable on any gear grinding machine is dependent upon a number of different factors. First, the accuracy required; second, the finish required; third, the amount of stock that has to be removed; and fourth, the number of times it is necessary to dress the wheel. Added to these, of course, is the fixed charge time which takes care of loading the gear, and unloading, and the setup time necessary to prepare the machine for some specific gear. This setup time can vary from a few minutes on some machines, to a few hours on other types, and according to the extent of changeover necessary when changing from one gear to another.

Different types of machines give different rates of production. For instance, a generating machine with a recipro-

FIG. 18



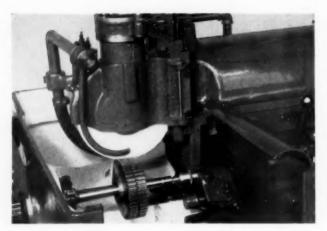


FIG 19

cating wheel ram or work table will take practically twice as long to grind a gear of the same dimensions as a machine with a non-reciprocating wheel head or table. The face of the gear that is to be ground with a machine having a non-reciprocating wheel is, however, limited by the wheel diameter used, and ranges up to $2\frac{1}{2}$ " face maximum on machines carrying the largest wheels.

On machines having reciprocating wheel rams or work tables, several gears can be stacked together on an arbor and this reduces the piece-to-piece time as the overrun per gear is reduced, and the index time is no more for the multiple gears than for one gear. It is obvious that a nonreciprocating grinder has an advantage for shank type gears.

Little Difference in Net Production

On a generating grinder, with a reciprocating table or wheel head, a series of fast cuts are taken to finish the involute on each tooth, whereas, on a form grinding machine the entire involute is ground at each pass of the wheel. There is little difference, however, in net production of one method over the other.

Generally speaking (say on a gear 6" in diameter having 36 T., 6 P. with a 1½" face) the tooth grinding time on a reciprocating type generating grinder will be approximately one minute per tooth or a half minute per tooth on a non-reciprocating type of machine. This is based on four cuts which should produce a gear with an involute of .00025" and a space error not to exceed .0002" and a pitch line runout of .001", assuming that .008" stock is allowed on each side of each tooth for the grinding operation.

We have purposely made the job described above a fourcut job, as we have in mind root grinding; and root grinding, of course, adds a bit of hardship to the wheel and, therefore, we take an extra cut. Where root grinding is not required, three cuts should be sufficient.

Gears that do not require the accuracy specified above, can be ground quicker by taking less cuts. The amount of stock which we have specified—as .008" on each side of each tooth—may appear excessive, but where great care is not given to heat treatment and the use of non-deforming steels, and not too much care given to the hobbing or shaping of the gear tooth, you will find that this is the average amount required to remove.

Large diameter gears of coarse pitch and wide face do not, as a rule, have the close tolerance requirement of the small gears; and, because of this and the more rugged machine construction, heavier cuts can be taken, resulting in production of a more favorable ratio than the 6 P. 36 T. gear mentioned above.

There is no difference in the producing of Master Gears, so-called, over ordinary commercial gears except the time required in grinding.



FIG. 20, ABOVE.

FIG. 21, BELOW



In conclusion, it is well to remember that although gear grinding machines—like every other type of precision grinding machine—have been previously looked upon as tools requiring the services of highly skilled operators, present conditions have largely disproved this fallacy. This was brought about by the war when, in some cases, girls took over the operation of these machines and handled them almost like veterans. Additionally, great numbers of non-experienced men with very limited training, having taken over the operation of gear grinding machines, proved they could produce gears just as efficiently as some of the old-time grinder hands; and, they are continuing to do so today.

New Molding Material

A COMPARATIVELY NEW ALLOY, known as Moldaley and recently introduced by Trethaway Associates, 37 Wall St., New York, indicates wide possibilities as a molding material for the casting of plastics, rubber and other materials. It is especially recommended for molds for casting lower temperature fusing materials; rubber molds, and wax molds for precision casting process.

It is also suited for master patterns, models for engraving machines, forming dies for thin sheet metal and thermal plastics, proof casting of molds and forging dies and, in addition to use as chuck jaws for holding irregularly shaped parts, may be used as a protective coating on wood patterns and core boxes.

Moldaloy melts at 480° F., has a hardness of 22 Brinell, compression of 8000 pounds per square inch and a tensile strength of 11,500 psi. Shrinkage is approximately .001" per inch, the latter an important consideration when working to close tolerances. That this material will find a wide field of application is indicated by enquiries for materials with the properties stated above.

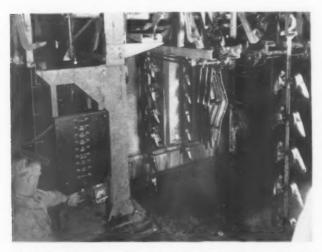
World's Largest Plating Plant Eliminates

All Manual Handling

Entirely Automatic Processing Produces An Acre and a Half of Plating Each 8 Hour Shift

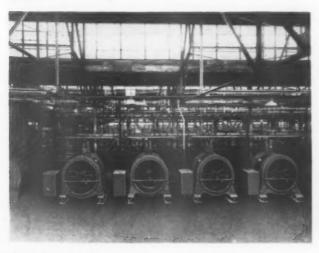
Long awaited as one of the big industrial news stories of the year is the account of the world's largest individual electro-plating plant. This ultra-modern tool, to use that inclusive term, was engineered and recently installed by the George L. Nankervis Company, 5442 Second Blvd., Detroit, for one of the largest of the midwestern automobile manufacturers. The entire plant, which is 660 ft. long and 50 ft. wide, was completed in the record time of eleven months.

The plating machines, which were built by the Meaker Manufacturing Company, consists of three sections one each for copper, nickel and chrome. The first sec-



Master Panel at the starting end of the Copper Section, typical of controls at each of the plating machines. If for any reason the machine should be stopped, a trouble light on the master panel flashes a warning and indicates the location of trouble. The machine cannot be started again until the light is off and a warning signal has sounded for at least 30 seconds.

Four of the total of twenty-two Chandeysson motor generator sets that supply the electrical energy for the plating procedures. These generators provide a total capacity of 285,000 amperes which, if converted to the proper voltage, would supply electric power to 7,000 homes.



tion, which is for copper, is 207 ft. long and includes fifteen automatic operations requiring 52 minutes to complete the cycle. The main Copper Plating tank contains 58,000 gallons of copper plating solution, which is kept in constant circulation at the rate of 1,500 gallons per minute and is filtered at the rate of 1,260 gallons per minute. The circulating system passes through sixteen heat exchangers which maintain a constant, predetermined temperature. By means of pump equipment, the entire content of the copper plating tank can be transferred to an adjacent storage tank in 25 minutes.

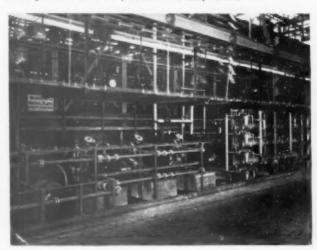
The Nickel Plating Section, which is 250 ft. long, includes fourteen different tanks and operations and requires 64 minutes for a complete cycle. The nickel plating tank contains 67,200 gallons of solution or the equivalent of 8½ tank cars. The plating solution is filtered constantly and heated with fifteen heat exchangers, with part of the solution being circulated passing through an electrolytic purification tank which is connected to a General Electric 2,000 ampere, 6 volt rectifier.

Safety Predominates

The Chrome Plating Section is 139 feet long and includes ten automatic operations. The main chrome tank, which has a capacity of 15,700 gallons, is divided into two compartments. This permits two lanes of work to be operated at different cathode current densities. The chrome plating solution is also circulated through heat exchangers, and also through coolers to maintain a predetermined temperature.

At the starting end of each automatic machine is a master panel which, in addition to other controls, includes a trouble light. Should the machine stop, for any reason, the light will immediately signal the stoppage and will further indicate the location of trouble, if any. The machine cannot be started again until the light is out and a warning horn has been sounded for at least 30 seconds. In addition to the master panel, a

The plating solutions are filtered constantly and heated with heat exchangers to maintain a predetermined temperature.



stop cord runs the entire length of the automatic machines.

The plating capacity of the three automatic plating machines—copper, nickel and chrome—is 22,500 square feet. This is a total of 67,500 sq. ft. or, in round figures, an acre and a half of plated surfaces per 8 hour shift. The electrical energy for the plating procedures is supplied by twenty-two Chandeysson motor generator sets ranging in size from 5,000 amps, at 6 volts, to 15,000 amps at 12 volts. The total capacity is 285,000 amps which, if converted to proper voltage, would be sufficient to supply electric power to 7,000 homes.

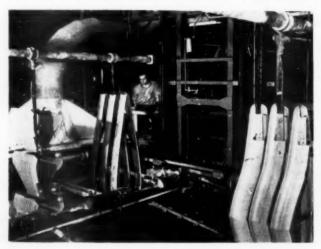
Demineralizers, with capacity of three thousand gallons per hour, furnish water for the plating tanks and the rinses preceding the plating. The temperatures of the heated solutions, and levels on all plating tanks, cleaner tanks and power wash machines are automatically maintained. All rinse sprays operate intermittently, as the work is being raised from the tank, by means of remote control switches, relays, and timers. The total capacity of all the tanks on this project is in excess of 500,000 gallons, the equivalent of fifty-five tank cars of solution. Ventilation, of all tanks that require it, is assured by thirty-two blowers with a total capacity of 434,000 cubic feet per minute.

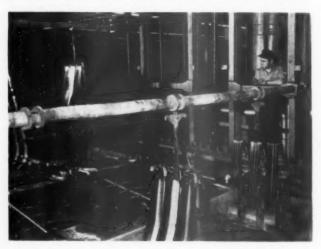
To convey an idea of the magnitude of the undertaking and the work entailed to complete this greatest of plating plants, 8,600 tons of dirt were excavated for the pit, while 4,200 tons of concrete, and 92 tons of reinforcing steel, were required for the 19,000 square feet of finished concrete surface. The automatic equipment took 400 tons of structural steel, while 600 tons of steel went into the tanks and an additional 90 tons of sheet steel into the exhaust system.



This completely automatic plating plant takes care of practically all of the plating requirements of leading automobile manufacturers. Parts involved vary from 0.8 sq. ft. to 4.0 sq. ft. of surface, and a maintained, predetermined deposit is assured on all plated products.

Views from the catwalk that runs the full length of the completely automatic plating machines, showing parts immersing and merging in and out of the plating and cleaner tanks. Intermittently operating rinsing sprays are provided; also provision has been made for ventilation.





Clark Offers Free Inspection Service

Pointing out that many machines, sold by W.A.A. on an "as is" basis, suffered from neglect on the part of the releasing government agency, Clark Instrument, Inc., 10200 Ford Road, Dearborn, Mich., now offers free inspection service of Clark Hardness Testers sold by W. A. A. These machines will be cleaned, tested, and inspected if returned to the factory by the purchaser who, however, will be required to pay shipping charges both ways. Where machines require reconditioning, the company will give an estimate of costs, for approval, before work is performed. Machines will then be reconditioned at actual cost for materials and labor.



Drawing Die Problems and Formulae

A Comprehensive Treatise Covering Advanced Design and Construction Of Simple and Compound Drawing Dies for the Mass Production Industry

Installment No. 5 of a Series-The Techniques of Drawing

IN THE PROCESS of drawing, metal will stretch readily within its limits but resists compression; consequently, any drawing operation that requires compression of the material will meet with a resistance that tends to result in wrinkles.

The walls of a drawn shape are subject to compression stresses and shrinking in the direction parallel to the wall. Thick metal will shrink considerably more than thin metal which, subject to compression, tends to wrinkle rather than to shrink. Special measures are therefore required if the desired shrink exceeds a certain value in order to control, prevent, or entirely eliminate, the buckling or wrinkling of the wall. The actual amount of shrink which can be enforced by drawing, without wrinkling, is very restricted and depends on numerous factors as, primarily, upon the thickness and the hardness of the metal, and upon the height of the cup and its radius.

A cupping operation is the least complicated of drawing operations, and in order to acquaint the reader with what actually takes place during drawing operations, the elementary principles are illustrated in Figs. 43, 44 and 45. For an example, the blank is represented by a circular piece of paper 5" in diameter. Place the disc of paper on top of one of the tumblers which represents the die; place the other glass in the center of the disc of paper. Push the upper glass into the lower; obviously, the result obtained is a series of wrinkles around the periphery of the disc as shown in Fig. 45.

If thin metal were used in place of the paper, the wrinkles would also appear in the side walls of the drawn cup. The aforementioned example pertains to relatively thin materials, whose thickness does not exceed 3/32". For materials whose thickness exceeds 3/32", there is a possibility that no trouble with wrinkles will be encountered, because the thicker the metal, the stiffer the part will be; consequently, the more resistant the material will be to wrinkling and buckling.

Two good illustrations of the changes that take place when drawing are shown in Figs. 46 and 47. The blank.

laid out in squares previous to drawing, shows that the drawing operation "plastically rearranges" the metal. The flow of metal, in drawing a rectangular shape, is illustrated by the change in dimension of the original squares as shown in Fig. 46. The greatest change of the square sections is especially prominent in the corners.

For rectangular and square draws, the clearance in the corners of the die should be 6 to 8% more than the clearance for the edges and sides of the die. By that, it is meant that if a 4" square shell of .062" material were to be drawn 1" high with a 34" corner radius; then the



FIG. 44. Simulates drawing action.

punch should measure 4" square and the corner radius of the punch should be .750" minus 7%t*, or .746"; the die should measure 4" plus $2 \times$ (t plus 10%t), or 4.1364" and the corner radii of the die should be .750" plus t plus 5%t, or .815" radius.

In order to obtain the exact contour of a blank for a rectangular or square shell, the blank must be determined by trial and error. However, it is possible to approximate it very closely. A shallow rectangular or square tray of comparatively little depth will require a blank of rectangular or square shape (as the case may be) with the corners having a true radius. The blanks for rectangular or square shapes of medium depths will have short straight sides and ends, with the corners cut on a double ogee curve. Deep hexagon, octagon or square shells are predrawn as a cylindrical cup. Deep rectangular shells are usually drawn from an oval shaped blank.

*Throughout the text, metal thickness will be referred to as (t).

FIG. 43. Left to right, representing the punch, the blank and the die.



FIG. 45. Simulates drawn cup.



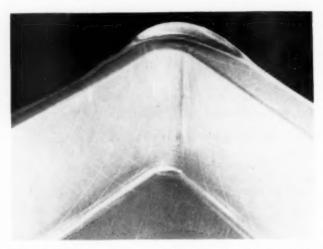


FIG. 46. Illustration of flow of metal during drawing of a rectangular shell. Notice how the outline of the square sections has changed at the corners.

Fig. 47 illustrates the flow of metal in a cylindrical shape. Even though the dimensions of the original squares have been changed considerably, the area remains practically the same, indicating little change in thickness of the metal as was the case in rectangular shells. Thus, no allowance has to be provided in any particular part of the tool for thickening of the metal.

The drawing of a dome, bowl, hemispherical or conical shape is considerably more of a problem than square and cylindrical shapes, especially when drawing thin gage materials. Therefore, to eliminate buckling in the final operation, a preliminary draw is often required so as to place sufficient metal in the correct position.

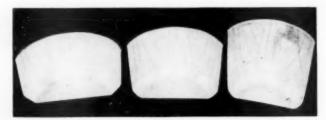


FIG. 47. Three drawn, circular shells illustrating the flow of metal during drawing operation. Photo by courtesy of Aluminum Company of America.

The preliminary operations are usually the cutting operations—that is, blanking, piercing and shearing. However, some operations are drawn first and then trimmed. It is good practice to construct all forming, bending and drawing dies first, then to construct the blanking tools. It will also be found advisable to perform drawing operations that have flanges, first, and to trim to size in subsequent operations. In any event, always construct the cutting dies after the flat layout has been developed from the forming or drawing tools.

There are instances when dies can be designed to blank and draw a shallow cup simultaneously without encountering any difficulty with the flat development. This is especially true in the case of cylindrical shapes. However, when high production demands compound dies, it is economical to construct single operation soft dies first, to be certain of the developed blank size, and then to construct the permanent tools.

To obtain the desired results in articles which require several stages, it is sometimes necessary to make numerous changes to the tools, both in design and construction. It is economical to develop the article from temporary tools, which are left soft. The temporary tools should be constructed to perform one operation at a time and, by exercising care in setting the dies up in the press, the die sets can be eliminated. When coordinating holes are required to match a component part, ignore the simple pierce dies; instead, lay out and drill the formed parts separately. By following this sequence of preliminary tooling, many inexpensive changes can be applied quickly, with results obtained in the minimum work hours.

Note: Do not perform any piercing operations preceding a drawing operation. When piercing operations are demanded in the flanges of a shell, pierce after the drawing is completed. Because, if the piercing is performed previous to drawing, the relationship of the holes can change with the various pressures, materials, and set-up. All piercing operations that are required in the wall of a shell must succeed the drawing operation because the holes not only will elongate, but will "gall" the walls of the die that they pass over.

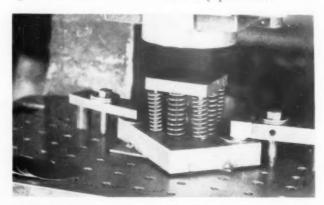


FIG. 48. Temporary cupping die; spring-loaded pressure ring. "Nest" machined to receive blank.

Such a temporary die is shown in the three Figs. 48, 49 and 50. Fig. 48 illustrates the spring-loaded pressure ring with a nest recessed %t to receive the blank. Fig. 49 shows the blank located in the nest previous to the press cycle. Fig. 50 shows the completed cup.

The design of the rubber-actuated cushion, illustrated in Fig. 51, is detailed for the small operator who is not financially able to purchase an air cushion. The "home made" cushion also comes in handy when an additional cushion is necessary, as in cases where presses are especially adapted for drop through blanking operations only.

A cushion must be capable of applying pressure to the blank and of maintaining that pressure during the

FIG. 49. Blank located in "Nest".

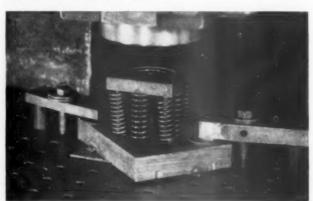




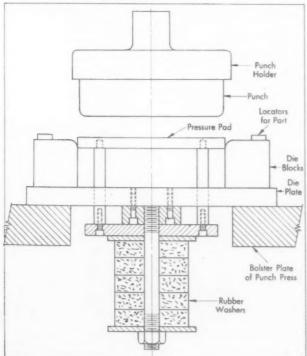
FIG. 50. Completed cup. Photos, Figs. 6, 7 and 8 by courtesy of Catom Mfg. Co., Dallas, Texas.

forming cycle. When the punch or the die, as the case may be, strikes the pressure ring and presses it downward, the pins screwed into the bottom of the ring transfer this force to the plate bolted to the lower ends of the press. The plate pushes against a stack of rubber washers approximately 5" diameter. The rubber washer, in turn, is held on a 1" center rod by an adjustable nut. The upper end of the 1" rod screws into the stationary block bolted to the subbase of the die.

The adjustable nut screwed on the lower end of the rod is used for retaining the steel washer and for varying the pressure applied. Ample adjustment is provided by about 4" of threads on the lower end of the rod. The varying Shore hardness of rubber washers can be used to exert the required pressure for different classes of work. The rubber unit is detachable and may be used on any drawing or forming die designed for it.

The addition of the pressure ring makes possible the drawing of a cup with the elimination of wrinkles. The pressure ring is actuated by means of an air cushion located beneath the bolster plate of the press. In the event that an air cushion is not available, a spring or rubber-actuated pressure ring will usually serve the purpose. The pressure ring has a "nest" (or recess)

FIG. 51. Rubber-actuated cushion.



machined approximately %(t); this recess should be provided for materials of 0.040" thickness and up. For materials thinner than 0.040" the blanks should be nested by locating pins. Naturally, locating pins that extend higher than material thickness must have holes drilled in the face of the die to receive them, or be spring-loaded so that they depress when contacted.

The cupping die, Figs. 52 and 53 and 54, constructed for materials of 0.093" thickness and under, operates as follows: as the press descends, the die which is secured to the punch holder contacts the blank which is supported by a pressure ring. The two opposing forces supply a clamping action and help keep the material taut while it is being drawn down over and around the drawing punch contour, (see Fig. 53 [a]). Fig. 52 shows the blank located in its nest. Fig. 53 illustrates the drawing operation, both partially and entirely completed, and Fig. 54 shows the die at the bottom of the press stroke.

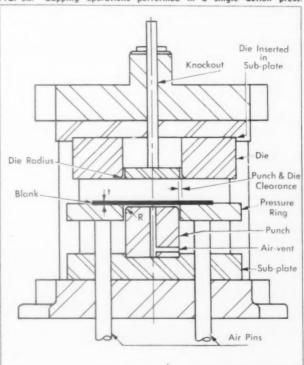
Clearances

The clearance between the punch and die, and the radii of these two members, plus lubrication, prevents the bottom of the cup from being blanked out as in the case of the blanking die. The general clearance between the punch and die is metal thickness plus 5% to a side; however, clearances will vary for different materials and will be discussed separately later on.

To determine the size of the punch and the die, let us suppose the cup is drawn from 0.060" CRS; then, the inside diameter of the cup should be 2" plus $2 \times$ (t plus 5%t) or 2.126".

It will be found that, during a drawing operation, the shell will cling to the punch, and the softer the metal the tighter it will cling. Therefore, the size of the punch will govern the size of the shell. As the press descends, however, the area of the part held by the pressure ring decreases with the descent until, when the metal leaves the pressure ring entirely, it has no support whatsoever. Consequently, the metal will cling less to the punch at the top of the drawn shape, and since the edge

FIG. 52. Cupping operations performed in a single action press.



of the drawn shape is under less tension with the descent of the press, it is significant that the metal will thicken gradually toward the top.

As the press ascends, the pressure ring forces the cup from the drawing punch, which in turn sticks into the cavity of the die, and at the top of the stroke the cup is ejected by the knockout shown at K. The clearance between the punch and the pressure ring shown in Fig. 54 at C₁, should not exceed 0.010".

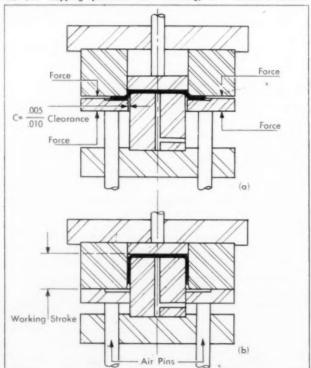
Knockouts and Ejectors

When drawing operations are performed, provisions must be made to strip the work from the punch and also to eject the work from the die. Spring-loaded stripping fingers will perform very satisfactorily. Sometimes spring-actuated ejectors are employed; however, when a choice arises between a spring-loaded knockout and a positive knockout, always select the latter if possible, especially when drawing heavy materials.

For example, when stripping cups of heavy gage materials from a punch, springs of great compressive strength which exert tremendous pressure are required, and even then they might fail to exert sufficient pressure. Also, high pressure springs that are actuated with the descent of the ram must be calculated in addition to the tonnage required to perform the drawing operation. The positive knockout method is the most economical and convenient method known, and when it is located concentrically with the punch shank, it will eject the drawn shape easily and rapidly with each stroke of the press.

Note: When the positive knockout method is used for ejecting, there is one cardinal rule to remember, and that is: as soon as a production run is completed, the first thing to do before upsetting a die is to loosen the adjusting screws on the sides of the press which contact the parallel bar which, in turn, contacts the knockout in the die. Failing to observe this rule will result in damage to both the tools and the adjusting screws inasmuch as the shut height of the next die may exceed that of the die previously run.

FIG. 53. Cupping operation. (a) = drawing; (b) = bottom of stroke.



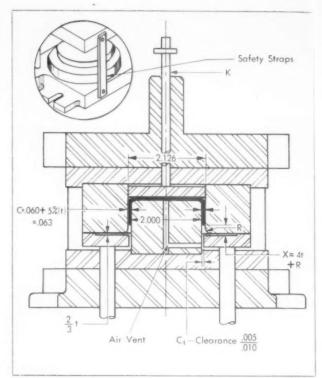
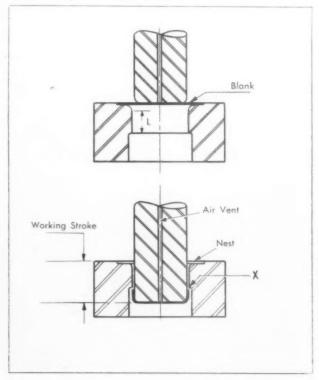


FIG. 54. Cupping operation.

It is very important to provide an air vent in all drawing dies; this helps prevent breaking the bottom out of the cup and eases the stripping from the punch. It is also good practice to provide safety straps (as shown in the insert of Fig. 54) for all types of dies. Safety straps will save many a smashed toe and will help prevent accidents to the tools when being transported from the tool crib to the work station, and while being set up.

FIG. 55. Single-action "push-through".



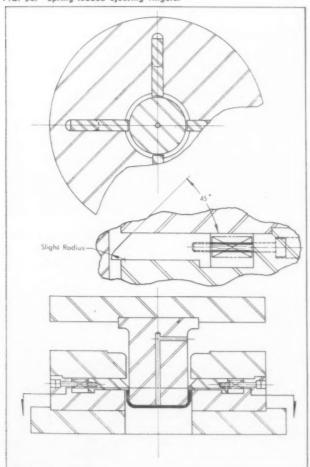
Selecting the Drawing Die

The size and capacity of the press depends on the following factors: 1. Diameter or perimeter of the blank. 2. Thickness of the material (t). 3. Shape of the article. 4. Alloy and temper of the material and also its tensile and shear strength. It is unwise to use hasty judgment when confronted with any drawing operation, no matter how simple it may seem. For example, let us assume that all types of equipment are available, and the quantity required is 500 cups 3" in diameter × 3," high, and the material is 0.125" cold finished steel. An appropriate design would be like the one shown in Fig. 55. Since the quantity required is small, it would be foolish to construct either a compound or double-action die because the initial cost would be expensive for such a small quantity.

The die shown in Fig. 55 is commonly known as a "push through" die and is mounted in a single-action press. A push through constructed die should always be considered since, because it eliminates additional handling, it produces about three times the amount of the ejected type. The length of the "land" (shown at L) should not exceed $\frac{1}{2}$ ", because a land that is too long will generate excessive heat which would anneal the tools in a very short time. Also, the longer the land, the more difficult it becomes to keep lubrication at the bottom of the die.

In operation, the blank is located in the nest; the press descends and forms a cup, and on the return stroke the cup is stripped from the punch at the corners marked x in the die. Note: Do not use this type of stripping for high-production runs,*** because there is a

FIG. 56. Spring-loaded ejecting fingers.



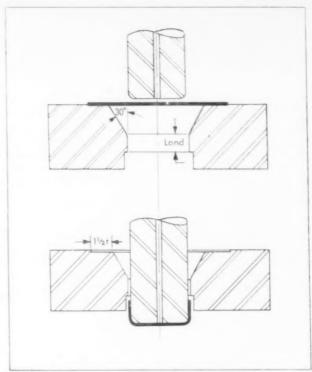


FIG. 57. Single-action press — cupping heavy materials.

possibility that the edge of the die might break or chip. Also, if a cup should fail to strip, the operator might overlook this error and draw another part over the one already stuck to the punch; consequently, double metal thickness might burst the die. A positive method for stripping is by the addition of the positive ejecting "fingers" shown in Fig. 56.

Tapered Entry

Another appropriate design for low-production runs of material 0.093" and up is the one shown in Fig. 57. This is known as a tapered entry die. The taper of the drawing die varies in different shops from 15 degrees to 45 degrees; however, 30 degrees is the one most commonly used. The tapered entry eases the drawing operation, is less severe to the tools, requires less tonnage, and generates less heat. The operation of the tapered entry die is the same as previously discussed.

**High production will be referred to as quantities from 5000 to 50,000. Quantitles exceeding 50,000 will be dealt with separately.

End of Installment 5, Installment No. 6 will follow in September the tool engineer.

Show to Exceed Expectations

Attendance at the Machine Tool Show, to be held in the Dodge-Chicago plant, Chicago, September 17th through 26th, may easily exceed the original estimate of 100,000, according to Swan E. Bergstrom, Chairman of the Show Committee of the National Machine Tool Builders Association. Mr. Bergstrom, who is Sales Manager of the Cincinnati Milling Machine Company, said that a tremendous attendance, both from the United States and abroad, is indicated by the heavy flow of advance registrations being received daily at the Association offices in Cleveland. Already registrations have been received from 22 foreign countries, Mr. Bergstrom reports, including the Scandinavian states, the U.S.S.R., the western European countries in addition to an official party of 30 from the British Machine Tool Trades Association.

Bethlehem Steel Expands Facilities

A UNUSUALLY EXTENSIVE expansion program, just completed at the Bethlehem plant of the Bethlehem Steel Company, includes improved layouts with equipment rearranged for more efficient operation. Facilities as a whole have been mechanized, providing greatly improved working conditions and greater all-around safety. In terms of "plant layout" alone, the modernization is futuristic and noteworthy.

New equipment consists mainly of controlled heating, cooling and heat treating facilities, and standard and special machines used in the various finishing operations. Because of the great care required in maintaining internal soundness in heat-sensitive types of tool steels, all furnaces are equipped for automatic control; furthermore, the new equipment provides for controlled cooling and inspection after every forging and rolling operation.

All Bethlehem tool steels are made by the electric furnace process. The larger furnaces for this purpose were built during the late war, while the smallest is about ten years old. All are machine charged and equipped with automatic control devices, thus eliminating any complicated sequence of manual operation.

High speed steels, air-hardening and hot-work steels, and similar grades, are made in 7-ton arc furnaces and a group of three 1000-lb. induction furnaces. The first (top charged) has been equipped with a modern hy-

draulic roof lift to speed charging, and with an automatic, continuous electrode regulator to maintain desired power input and to facilitate carbon control.

The production from the 7-ton furnace is normally cast into square hot-top ingots of cross section ranging from 6 to 16 inches square, while two induction furnaces are tapped into one ladle and teemed into ingots ranging from 6 to 13 inches square and weighing from 200 to 2000 lbs. The ingots are either cogged on a 6-ton hammer, or rolled in a 16" hand mill with specially designed rolls. The rolled billets in 2" or 2½" round sizes are control-cooled, annealed, inspected internally, straightened, rough turned and returned to the mills for rerolling into bars.

Immediately upon stripping, the hot ingots are first preheated, then brought to desired forging temperature, and reduced to billet sizes on a 6-ton steam hammer equipped with a manipulator. The billets are then buried in diatomaceous earth, for slow cooling over a period of 100 hours. After cooling, they are tested for internal defects by hot-acid etching, then ground to remove surface imperfections prior to further reduction to bar size. With variations, these processes are repeated until the finished bars go to final inspection and storage. Control is automatic throughout, and every possible facility has been provided to produce fine tool steels with meticulous control of quality.



Among the several types of automatic furnaces are these twin-type, oil-fired heating furnaces in the hammer shop.

Four hammers, of 1000, 1500, 2500 and 4500 lbs. capacity are used in forging tool steel billets.





Billet preparation prior to rolling. Suction fans discharging into dust accumulators make the grinding operation practically dust free.

Interior of tool steel mill depot, Tool Steel Dep't, Bethlehem Steel Company. Stock ready for shipment is stored in steel racks.



36

New Tooling Method Facilitates Aircraft

Assemblies

A NEW METHOD of tooling, recently developed and put into operation at The Glenn L. Martin Company, Baltimore, Md., now assures interchangeability of large aircraft assemblies by equalizing the thermal expansion of both tools and parts during the manufacturing period when wide fluctuations in temperature may

As, for example, steel and aluminum both will expand, but not to the same extent, under a temperature change of 55° to 95° F. Thus, the change in length of a steel tool, 300 inches long, amounts to .076 inch when subjected to a change of temperature of 40°, whereas the change in length of an aluminum part, drilled in this tool, will amount to .148 inch when subjected to the same change in temperature.

Formerly, with tools of steel being used on parts of aluminum (a basic aircraft metal), thermal changes caused expansion at different rates in the two metals, making it impossible to match holes drilled between temperature changes.

Solution to the problem came with the use of aluminum alloy in tools as well as in parts. Thus, thermal expansion or contraction in tools and in parts occur in the same ratio, since both are now of the same metal.

When tooling up the Martin 3-0-3, twin-engine, 36-passenger, pressurized airliner, the Martin Company was faced with the problem of making the leading edge of the wing inter-changeable on the front spar. The leading edge is attached to the spar with No. 10 screws at one-inch pitch for a length of 300 inches.

The development of an anti-icing system, by circulating heat in the leading edge, made it necessary to have this component frequently removed for inspection purposes, and it was also required that it be interchangeable. Also, the flap installation of advanced

design requires the fittings to be very accurately located and that the flap be readily interchangeable on the wing. The hinges for this flap are spaced over a distance of 30 feet.

When faced with tooling these components, the Martin Tool Engineering Department soon realized that something had to be done to neutralize the effects of thermal expansion on the tools and parts. Especially so, since it was found that it was possible for the shop to vary by as much as 40° in temperature throughout the year.

The thermal coefficient for aluminum is .000013 of the length for each degree of temperature, and for steel is only .000006. It therefore becomes apparent that an

Interchangeability assured as a result of equalizing thermal expansion of tools and parts

aluminum part which perfectly matched the drill jig, when drilled at a temperature of 55° , would be more than $\frac{1}{16}$ of an inch longer than the jig if replaced in the jig at 95° .

This is graphically illustrated in Fig. 1. Here, we have steel drill jigs for the spar and the leading edge which have been co-ordinated by a master drill gage at a temperature of 70° and to a length between the extreme holes of 300 inches. The spar jig is used at a temperature of 55° and drills a spar to 299.973 inches between holes instead of 300 inches, because the jig had shrunk due to cold.

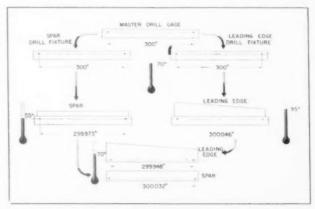


FIG. 1. Diagram showing the effect of temperature changes on long inter-changeable components, when drilled in steel jigs, at The Glenn L. Martin Company, Baltimore, Md.

FIG. 2. Leading edge of wing being drilled in fixture with aluminum drill bars. This is a new development, now being used in the manufacture of the Martin 3-0-3, a pressurized, twin-engine, 36-passenger luxury airliner designed and built by The Glenn L. Martin Company.



A spare leading edge is drilled, some months later, at a temperature of 95°, and the holes are 300.046 inches apart due to the heat. This makes a difference of .073 inch between the spar and the leading edge at the time of drilling. When later, the leading edge is attached to a spar and the temperature is 70°, each component has changed again in length, the leading edge shrinking to 299.953 inches and the spar expanded to 300.028, which leaves a final difference of .075 inch.

It was then decided to make all three tools on a steel base, but to have the drill bars made of aluminum alloy which would have the same co-efficient of thermal expansion as the parts to be drilled. These bars were anchored at the outboard end, but were allowed to slip endways from that point so that the expansion and contraction would be adjusted automatically and the bars would all have the same length at a given temperature. This is shown in Fig. 2, which is the leading edge fixture.

In this picture, approximately every tenth hole has been drilled, the leading edge has been doweled to the jig through these holes, and the clamps have been removed. The operators are now drilling the remaining

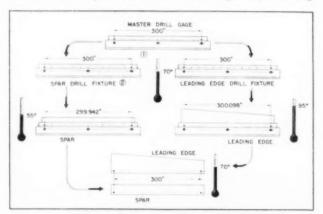


FIG. 3. Diagram showing that, through the use of aluminum alloy in tooling, the effects of temperature changes have been eliminated in attaining inter-changeability of parts in the Martin 3-0-3.

holes, and, although the bars may slip endways, they are held neatly in the other direction by the use of shoulder screws working in machined slots.

The master drill gage, which was designed to represent the spar, has the aluminum bars for equalizing thermal expansion and is equipped with hardened bushings. It also has a series of pads and leveling plates so that it can be located, first in the spar fixture and then in the leading edge fixture, in its correct position throughout its length.

The attaching holes are then transferred from the gage into the other two tools, after which the aluminum bars are removed from the jigs, the holes enlarged, and bushings inserted. In this way, the spar jig and the leading edge jig are perfectly coordinated.

The results of using aluminum alloy jig bars with these tools are shown graphically in Fig. 3. The tools are all made at a normal temperature of 70° and are exactly matched for a length of 300 inches.

The leading edge is later drilled at a temperature of 95° and the tool has lengthened to 300.098 inches. Still later, a spar is drilled at a temperature of 55°; the tool has shortened to a length of 299.942 inches—a difference of .156 inch.

When, however, the temperature is again 70°, and the leading edge is installed on the spar, it has shrunk to 300 inches due to the change back to 70°, and the spar



FIG. 4. Drawing showing method of attaching inter-changeable leading edge to wing structure of the Martin 3-0-3, twin-engine, 36-passenger, pressurized airliner now under construction.

has expanded to 300 inches for the same reason. It can therefore be readily seen that, with this method of tooling on aluminum components, that temperature would have no effect on the final results.

Fig. 4 shows the ship with the leading edge involved exploded, while the insert shows an enlarged section with the method of attachment emphasized. The tooling for the flap installation followed along the same lines as the leading edge. In this case, fittings were located by this method.

A master gage, made of aluminum bars, was designed so that it could be located accurately, first, in the flap assembly fixture; second, in the trailing edge fixture; and third, in the wing main assembly fixture. These three fixtures all were equipped with aluminum alloy bars mounted on steel so that they were held accurately but could creep spanwise with any change in temperature.

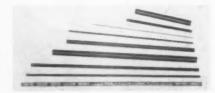
The fittings, to be located with the master coordinating gage, were mounted on these bars, with the result that all fixtures involved in flap inter-changeability were coordinated regardless of the temperature at which they were used.

This type of tooling was found to be not too expensive to build because aluminum was used only at strategic locations; besides, the extra cost was more than offset by the accurate results obtained. The first leading edge fitted perfectly on the first wing assembly.

Now!—Cemented Carbide Rod

Suggesting an infinite variety of uses, lengths of solid Carboloy cemented carbide rod—unground and in both random and specific lengths—are now available from stock from Carboloy Company, Inc., Detroit, Michigan. There are 15 standard stock diameters, ranging from 15%, with stock allowance on the diameter of from .007" to .012", on the smallest size, to .022" to .050" on the largest size. Random lengths furnished will vary

from 4" to 12", but with sufficient extra stock to compensate for any rough ends which may occur in stock.



Reviews and Previews

I MANK WITH an intensive development of cost-cutting tools, throughout industry, the National Automatic Tool Company, Inc., Richmond, Ind., announces a completely new line of small multiple spindle drilling and tapping machines. These machines—Model A-33A and A-33B—incorporate simplified design to speed production on light work of small holes where super-sensitivity and high speed are of paramount importance.

Superficially, both machines are alike, with the heads bored for 10 spindles. Model A-33A is equipped for both drilling and tapping, which makes it a combination machine, while Model A-33B, which is preferably used for tapping only, can be arranged for both drilling and tapping. Spindle speeds of both machines range from 650 to 3550 RPM. sheave arrangement providing 10 speed varia-

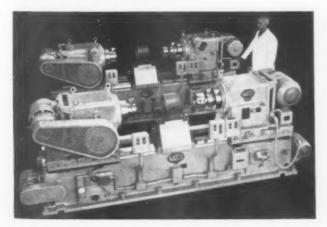


tions. Electrical The Natco Model A-33A.

equipment is enclosed and motors (furnished in 1 HP capacity) are available for 110, 220 and 440-v., 60-cycle, 3-phase alternating current.

Model A-33A provides hand and foot feed, or combination hand and foot feed and air-oil feed, a combination that permits close control for sensitive operations. The Model A-33B is equipped with treadle control air feed table and a hand crank that provides vertical table

Natco A-20 "A" Borface Machine.



adjustment. The feed of the table on this machine, which is especially suited for light precision tapping, travels 2½" maximum as compared to the 4" feed of the A-33A combination machine. The machine is provided with coolant system, cluster plate, slip spindle plate and other necessary equipment and attachments.

While complete details may be had in Natco Bulletin 247, superficial detail specifications for both ma-

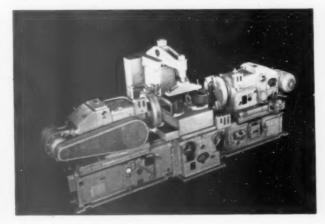


The Natco Model A-33B.

chines are as follows: Height 70", with over-all floor space required 2034"x 3314". Center of head to column face, 514"; floor to top of table. stroke up, 411/2" maximum; stroke down, 29" maximum. Feed travel of table. A-33A hand and foot feed and A-33B air feed. 216" maximum, and A-33A airoil feed combination 4". Maximum distance, table to head flange, 22". Drilling area of head is 51/4" x 93/4", with surface of table 9" x 12".

A LSO, BY NATCO, is the A-20 Borface Machine, which consists of either the A-20A or the A-20B Model units which may be mounted vertically, horizontally or in angular positions in the construction of multi-way precision boring machines. The only difference, between the two models, is that the "B" unit provides an auto-

Natco A-20 "B" Borface Machine.



matic cross-facing drive and control which is inserted between the rear end of the spindle unit and the spindle drive motor.

Developed to speed production of precision boring in hard-to-handle castings, and for use by semi-skilled operators, all Natco Borface units are provided with heavy-duty spindles mounted in pre-loaded precision bearings. Belt drive to worm and gear insures smooth power to the cutter bits. An idea of the capacity of the units may be had from the applications illustrated. For example, the two A-20 "A" type machines shown are arranged to rough and finish bore a range of 8 sizes of cast iron N.E.M.A. frame motor yokes with a minimum central bore of 7" to 11½" diameter, and a counterbore from 9¼" to 14½" diameter to a depth of \%16". Production on this job varies from 8 to 24 parts per hour, with limits of tolerance held ± .001".

The Type "B" unit shown is set up to face two valve bonnets simultaneously. The machine on which the units are installed incorporate automatic clamping as part of the work cycle. Equalizing and clamping is by hydraulic pressure. The applications shown, of course, merely illustrate two of many designs to which the units may be adapted, and suggestions for a wide variety of applications—turning, boring, cross-facing, under-cutting and other operations—may be had from Dep't 56, the National Automatic Tool Company.

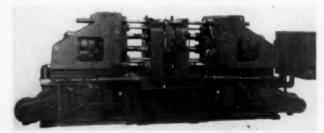
Designed and manufactured by Baker Brothers, Inc., Toledo, Ohio, is a new machine that employs an unusual method of handling turning and threading on a high production basis. While widely applicable to other types of work, the machine shown—Model 30 HH—is a two-way opposed floor type unit designed for operations on a steering knuckle pin, upper arm support.

Each of the two opposed units is furnished with a four-spindle fixed center multiple head for hollow milling and chamfering, and head provided with two additional drives for operating lead screw spindles for external threading, using collapsible die heads. Lead nuts for the threading operations are mounted in the fixture uprights, which also carry tool support bushings for supporting tools at cutting Stations 2 and 3.

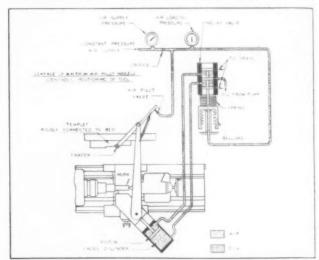
Both heads are arranged with double motor drive. One drive is for the four spindles, and the second motor, with reversing controls, is for the advance and withdrawal of the lead screw. The machine is furnished with a 4-station hand indexed trunnion fixture, and each station is arranged to accommodate two parts.

Operation sequences are as follows: At Station No. 1, load and unload two parts; at Sta. 2, chamfer both ends of knuckle pin, %" diameter and \(^{\frac{7}{2}}\)" depth. At Sta. 3, turn the O.D. 0.7855" to depth of 1\(^{\frac{7}{6}}\)", and at Sta. 4, thread 1\(^{\frac{7}{6}}\)" depth on a 0.7855" diameter. As previously stated, these Baker units can be adapted to a wide range of job problems, all with a view toward obtaining increased production with reduced unit costs.

Baker Model 30 HH two-way opposed unit machine.



EVER SINCE 1930, when the Monarch Machine Tool Company, Sidney, Ohio, brought out a lathe for successfully turning, boring and facing irregular contour work, there has been progressive development and refinement in equipment for producing this type of work. One of the most far-reaching advances in the art is now embodied in a comparatively new mechanism which Monarch has termed the "Air-Tracer".

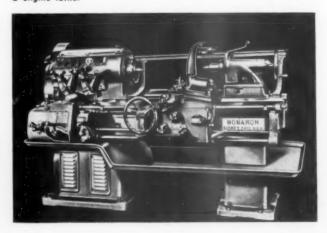


Operation diagram of the "Air-Tracer" equipment, which can be reconciled with the mounted attachment on the lathe shown in the photograph.

This device, which was described in the Tools of Today section of the August 1946 The Tool Engineer, is now manufactured by Monarch under exclusive license from the Bailey Meter Company of Cleveland, Ohio, who first introduced the device. In the meanwhile, Monarch has improved upon the design of the control, and the unit may now be attached to any new 14, 16, 18 or 20-inch Monarch Toolmaker or Engine Lathe. Other applications are expected to follow as rapidly as the necessary engineering can be completed.

The device combines an "Air-Tracer" with a hydraulically operated power circuit to produce work pieces with contours which match those of a master template within a limit of tenths. Also, since the motion of the cutting tool is continuous, increasing contours can be produced with a finish not possible heretofore. Contour shapes of almost endless variety can be produced, including molds, and diameters, tapers, square shoulders, necks and radii on a step shaft may be turned in a single cut.

The "Air-Tracer" equipment, shown applied to the Monarch Model C engine lathe.



Operation of the device is fairly simple. As shown in the diagram, the tracer opens the pilot valve which, in turn, regulates the air pressure in the bellows. Decreasing pressure in the bellows allows the spring to pull the relay valve downward enough to force oil in the front end of the hydraulic cylinder on the tool slide. This moves the tool away from the work. The backing-off of the tool slide continues until the pilot valve allows sufficient air pressure in the bellows to move the relay valve into neutral position and thus equalize the oil pressure on both sides of the piston on the hydraulic cylinder on the tool slide.

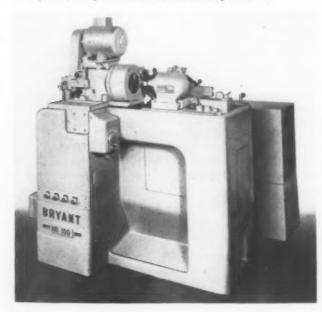
The lathe carriage is moved by the usual power or handwheel feed, and because the tool slide is set at an angle of 45°, the tool follows a path relative to the work, which is the result of the movement of the carriage and the hydraulically operated tool slide. The extreme example of this comes during the turning of a square shoulder.

BY THE BRYANT CHUCKING GRINDER COMPANY, Springfield, Vt., a recently introduced automatic Internal Grinder is particularly designed for the high production grinding of bore diameters from ¼" to 3", up to 4" deep. Named the No. 109, the new grinder will swing work up to 9" and is suitable for such jobs as ball and roller bearing races, gears, rolls, bushings and similar parts which can be produced most profitably in large quantities.

The most important feature of the machine is the comprehensive yet easily operated hydraulic and electronic control arrangement that provides for completely selective yet infinitely variable cycles. This control arrangement means that every grinding and truing operation can be timed to the split second, with idle time reduced to a minimum. The operator needs only load and unload the work, and to trip the valve to start the cycle; from then on, the machine operates automatically through the following cycle: Rough grind; true wheel; finish grind and return to chucking position as finish grind is reached.

While many new features have been incorporated into the design of the new machine, the basic and proven Bryant principle of cylindrical slide construction has

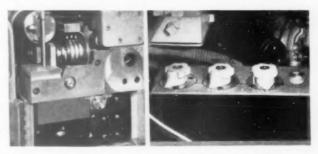
The Bryant 109 fully automatic Precision Grinding Machine.





Rear view of the Bryant 109, showing slide construction.

been retained. Hence, there is the assurance of maximum production with extreme precision. However, the 109 uses the new direct-mounted Bryant high frequency Wheelhead unit. With this drive, spindle speeds up to 100,000 RPM can be attained, thus providing efficient surface speeds for small bores. Provision has also been made for a balanced, belt driven wheelhead giving speeds from 200 to 2400 RPM.



Feed controls of the Bryant 109. Hydraulic controls of the Bryant 109.

Built-in rectifiers permit use of DC motors to supply driving power to the cross feed and work drive spindle; thus, an infinite number of feeds and speeds are available. The feed controls consist of three adjustable cams and five rheostats to provide extreme flexibility of adjustment and ease of set-up. The cams, which operate limit switches to control the rate of feed, are easily set to increase or decrease the feed rate at any position of the grinding cycle. Of the rheostats, which provide independent controls of the various positions of the cycle, one controls fast approach for rough grinding, two provide additional speed rates for rough grinding, and the last two control rates of speed during finish grinding. In addition to the above controls, two electrical timing devices may be adjusted to provide the desired length of "spark-out" for both rough and finish grinding.

To complete the automatic features, two methods of work size control are available. The standard machine is equipped with a wheel truing diamond that automatically compensates for wheel wear and maintains uniform size and accuracy in each piece. An optional measuring device can be provided to automatically gage the piece through the work spindle, and can further be used as a double check when fitted on the machine as extra equipment,

See September THE TOOL ENGINEER for Previews of The Machine Tool Show, to be held in Chicago September 17 through 26.

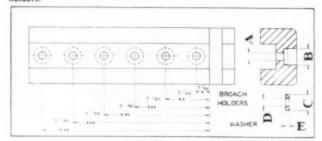
New Standards for Broach Inserts and Holders

As a result of an extensive survey, among its members, regarding the use of broaching equipment, the Broaching Tool Institute, with headquarters at 74 Trinity Place, New York 6, N. Y., has adopted standards on a method of dimensioning screw holes and washers for broach inserts and washers. The purpose of these standards is to provide tool engineers with a uniform set of specifications with which each of the broaching equipment manufacturers is familiar, and which will therefore make possible interchangeability of tooling.

The primary consideration, in developing the standard for screw holes, was to permit the best possible heat treatment without the restriction of controlling location of holes due to growth. Therefore, a broad tolerance is allowed on center distance of holes in broach inserts as well as in broach holders. To accommodate this variation of center distance, the holes in the holders are made sufficiently large and washers are used to compensate for the difference.

Among benefits to be derived from the use of this standard is that it will permit some adjustment in all directions for salvaging inserts when worn; also, there will

FIG. 1. Method of dimensioning screw holes and washers for broach holders



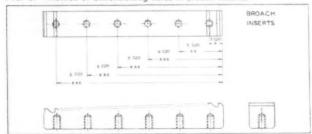
be assured interchangeability of inserts in holders which are made independently of the inserts. The broad tolerances provided by the method are shown in Figs. 1, 2 and 3. Fig. 1 shows the broach holder and washer, and Fig. 2 is a tabulation of dimensions for various sizes of screws. Fig. 3 shows typical broach inserts.

Also, by the Broaching Tool Institute, but not shown here, is a recently adopted chart of standard keyway broaches. This chart gives all salient dimensions for keyway broaches from ½" to 1", with information on thread type or notched type shank.

SIZE OF SCREW	*8	10	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4
A	17/64	19/64	23/64	27/64	31/64	35/64	39/64	43/64	47/64	55.64
В	17/32	19/32	23/32	25/32	29/32	11/32	15/32	19/32	113/32	119/32
C	7/16	1/2	5/8	11/16	13/16	15/16	11/16	13/16	15/16	11/2
D	13/64	7/32	9/32	11/32	13/32	15/32	17/32	19/32	21/32	25/32
E	1/16	1/8	1/8	1/8	3/16	3/16	3/16	3/16	1/4	1/4

FIG. 2. Tabulated dimensions for hole centers shown in Fig. 1.

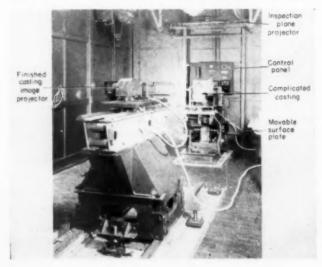
FIG. 3. Method of dimensioning holes in broach inserts.



Three-Dimensional Inspection of Castings

A METHOD OF INSPECTION and layout of castings, by three-dimensional projection of accurate layout drawings upon a rough casting, has been developed by engineers at the Pittsfield Works of the General Electric Company. The method, which has been successfully applied to thousands of intricate ferrous and nonferrous

Factory installation of G-E 3-dimensional inspection system, showing projector, light wand, adjustable surface plate, and control panel.



castings, has effected considerable savings in time and material. An unskilled operator with but limited training can employ the method, which assures layout within .015", whereas the usual bench layout requires inspectors familiar with machining practice.

Originally designed to inspect and lay out parts for subsequent machining, the method can also be used for a rapid inspection of finished parts. Projection may also be employed during an actual machining process, whether the part to be machined is stationary or revolving.

The installed apparatus consists of a layout image projector containing a photographic glass slide of the finished casting layout, which is projected by a lens directly upon the surface of the casting. To establish the plane of true projection and correct dimensions, a second projector—the inspection plane projector or light wand—over the inspection position is used. The light wand emits a sheet of light which falls vertically upon the casting. Both projectors operate in unison through a selsyn system.

When machining a piece which revolves and is symmetrical about the axis of rotation, the finished outline may be projected to serve as a template. This template-projection system may be used in fabricating duplicate metal parts for tanks, boilers, and other burned-out and welded pieces, and variations can be used for laying out intricate pieces, locating parts to be welded, shearing, and general layout operations.

Proposed Standard Sheet for Press Forging Dies

Proper clearances and fine surface finish add immeasurably to Die Life

THE MOST IMPORTANT difference between hammer and press forging dies is that hammer dies must strike face to face, in the finish blow, whereas press forging dies need not and should not. Forging hammers operate on the principle that the hammer is a falling body and, therefore, has its maximum velocity, energy and striking power at the bottom of its fall, which is the face of the die in the anvil.

Steam and air hammers differ from the drop type in that an extra impulse is imparted to the hammer to obtain a higher striking power and to insure greater control. The forging press, on the other hand, is con-

JOHN R. PARKS has been previously introduced to our readers. Formerly Forging Engineer with the Weatherhead Co., and a teacher of methods of precision inspection during the war, he is now President and General Manager of Hydro-Devices, Inc., Columbus, Ohio. structed on the principle of a lever operating between the main bearings and the bed, and therefore attains its maximum mechanical advantage at the bottom of the streke

Forging presses develop their power in proportion to the tensile forces that develop in the uprights—that is, in the integrally cast frame of the press, or in the tie rods, whichever way the press is constructed. The "striking power" of the press has little or no connection with the speed of the ram. Squeezing deformable materials between the dies produce the tensile forces referred to; therefore, it becomes evident that if the die faces should mate before the squeezing cycle is completed, considerable and, for that matter, useless tensile forces will be developed in the uprights or tie rods which may stall or damage the machine. In other words, the forces will be directed against the faces of the die, which become solid on closing, not against the somewhat plastic material of the work.

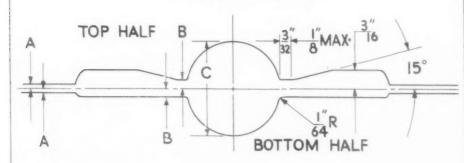
It is for this reason that the diagram shows a dieface clearance. The writer considers it advisable to specify "A" as one-half of the across-the-parting-plate tolerance, plus 5%. At this point, it may be noticed that

undersized parts may be likely although, with a good set-up and proper furnace temperature control, such a possibility is considerably minimized. Based on experience, it is the writer's opinion that it is better to risk occasional undersized parts than to risk damage to an expensive machine.

Dimension "B", in the diagram, is one-half of the flash thickness. In the majority of cases, the flash thickness should be held to hammer forging standards. However, judgment has to be exercised since, in some cases, more than the usual amount of excess metal has to be forced out of the cavity into the gutter. Then, thicker flashes should be specified.

It might be well, at this point, to show cause for the conclusions stated. One of the first conclusions arrived at, by the writer, when first having to do with press forgings, was that it was entirely different from hammer forging. And that, as a result, press forging dies had to be treated on a totally different plane if the maximum use of the then (wartime) scarce alloy steels was to be had.

STANDARD SHEET PRESS FORGING DIES



A=12 OF ACROSS-THE-PARTING PLANE TOLERANCE, PLUS .005".

B=1/2 THE FLASH THICKNESS.

C-MEAN DIMENSION OF DIE CAVITY.

- SURFACE FINISH OF CAVITY AND GUTTER ON BOTH HALVES SHALL BE SMOOTH POLISHED AND WITHOUT TOOL MARKS OTHER THAN DUE TO POLISHING. THIS PARTICULARLY APPLIES TO FILLETS AND CORNER RADII. WORKMANSHIP SHALL BE OF HIGHEST ORDER.
- 2. FACES AND BOTTOMS OF BOTH HALVES SHALL BE PARALLEL.
- MATCH FACES SHALL BE FRONT AND RIGHT AND SHALL BE AT LEAST ½ INCH HIGH. TONG-HOLD SHALL BE IN FRONT.
- 4. MATCH FACES SHALL BE STAMPED 'M' ¼ INCH HIGH. PART NO. AND DIE NO. SHALL BE STAMPED ON FRONT OF BOTH HALVES
- SIDES OTHER THAN FACES AND BOTTOMS AND MATCH FACES NEED NOT BE MACHINED SURFACES.

Observation of the minute movements of the die blocks and of the beds of the presses suggested an idea of the forces and their action within the blocks themselves. That idea was somewhat as follows:

In one complete working cycle of the press the forces in the die blocks changed from zero to increasing bending and compression to rapidly increasing tension and compression, and shear, and back to zero. All of these changes have a relatively long time span compared to the "shock treatment" of a hammer. Near, and at the bottom of the stroke where the flash is being extruded, the die is comparable to a high pressure vessel. The pressure is influenced by the ease of escape from the cavity.

Cooperation Suggested

These "guesses", to use that term, led to the conclusion that long die life could be expected from die blocks made as follows: (1) From steels that were more tough than hard and having high elastic limits in tension and shear; (2) with a high quality surface finish in the cavity to avoid that most common of die failures—viz, fatigue; and (3) with a high quality finish on the edge of the cavity and the gutter to reduce the friction on the flash and also to reduce to a minimum the pressures tending to burst the die blocks.

In connection with high surface finish, it can be pointed out that dies so finished should run from 100,000 to 175,000 acceptable forgings with little or no die

repair or reworking. Yet, while much has been done in connection with press forging non-ferrous materials with some extensions made to steel, there remains much to be investigated before a measure of control can be thrown around the process.

However, a long step would be taken if concerns making sapphire, diamond or other hard abrasive powders, and the several manufacturers of forging presses would get together with the University of Illinois, as an example, and some Federal research bureau, so that the problem of press forging could have a real going over.

The proposed standard sheet, here shown, was made up while the writer was employed by a company engaged in high volume production of aluminum and magnesium forgings weighing from a few ounces to several pounds. The die finish, in item 1, was stated chiefly in the interest of die life and not for surface smoothness of the resulting forgings.

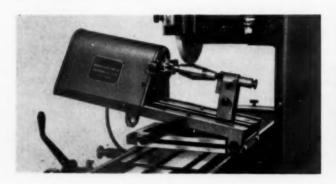
Die failure resulted more from fatigue than from any other cause. Tool marks were tolerated outside the die cavity if they were not excessively sharp or deep, and if in the direction of the flow of the flash. This last is highly important because roughness and tool marks running crosswise to the flow can so increase the resistance to the flow of the flash as to cause the wall of the cavity to bulge and finally break down. The smoother the surface, and the more highly polished—say to a mirror finish—the longer the die life.

Cylindrical Grinding and Indexing Attachment

IN LINE WITH CURRENT development of new, cost cutting, tools, and of particular interest because of its versatility, is a new cylindrical grinding and indexing attachment—No. 616—by the Brown & Sharpe Manufacturing Company, Providence, R. I. While the attachment, shown in Fig. I, can be used in combination with particularly any table type machine or can be mounted on a grinding unit—say an electrical grinder on a wider



FIG. 1 Above. FIG. 2 Below.



table—it is primarily designed for use on surface grinders. Thus, the surface grinder becomes a cylindrical grinder for small work.

Straight cylindrical and tapered work may be ground between centers, as shown in Fig. 2, or, if ½ diameter or less, can be held in the indexing sprink chuck. Where indexing is required, work can be held in the spring chuck, the collets of which take round work from ½" to ½" inclusive—a range that accommodates work of the most commonly required sizes. Parallel flats, or polygons, may be ground by locking the index plate and indexing for the required surfaces, as shown in Fig. 3.

The unit is entirely self-contained, with the motor completely enclosed and the indexing head and indexing spring chuck permanently lubricated and sealed. The attachment centers swing 6" diameter and take work 5\"\" in length. Maximum grinding angle is 45 degrees. Many other uses, besides grinding, suggest themselves for this versatile tool which, in many cases, makes unnecessary the installation of extra equipment for the grinding of cylindrical or flat work within its range.

FIG. 3



Automatic Form Grinding

It is a feature of modern centerless-grinding technique that, although the process was originally conceived, and for many years almost exclusively used, for the straight-through grinding of bars and simple cylindrical pieces, developments of late years have taken quite a different direction in the way of form-grinding. In fact, it is the experience of some of the principal manufacturers of centerless machines that about 80% of the requirements today are for form-grinding machines with attachments which will make the machines as far as possible automatic.

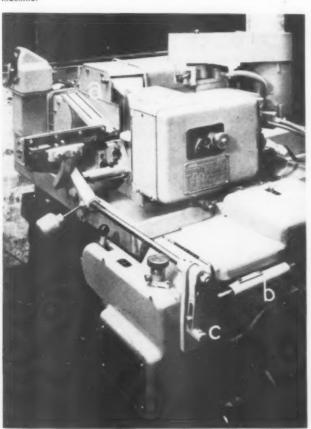
This trend is largely due to the labor situation, but it is also due to an increasing appreciation in many industries, quite apart from engineering, of the important part which centerless grinding can play in ensuring the economical and trouble-free production of small parts to the closest tolerances and to any required grade of surface finish.

The firm of Arthur Scrivener, Ltd., of Birmingham, has been responsible for many developments in the way of fully-automatic centerless grinding on their controlled-cycle machines, and the photographs reproduced in Figs. 1 and 2 show an interesting example of the trend.

The machine works upon a patented controlled cycle, in which (to describe the development in the briefest possible manner) a hydraulic slide does away with the old method of hand-operated plunge-grinding where the operator lays the piece on the workplate and advances the wheels for grinding by means of a hand lever.

In place of this relatively slow and laborious method of manual operation, the whole grinding cycle is performed

FIG. 1. Scrivener magazine for loading workpieces to controlled-cycle machine.



automatically from the loading of the piece to its final ejection, provision being made for reducing or increasing the cycle time by the mere turning of a knob. With such a machine, the work of the operator is confined merely to keeping the magazine charged with work.

The magazine shown in the detail photographs consists of a sloping chute, "a," on which the pieces are loaded. They descend by gravity to a position ready to be pushed on to the workplate between the wheels. As the controlled-cycle slide recedes and opens the wheels, the movement advances the pusher "b" which, in turn, actuates the override arm "c." This latter, through the intermediate counter-weighted shaft, advances the pusher rod "d," thus moving the bottom piece from the magazine on to the workplate between the wheels.

Split Second Timing

The advancing piece ejects the previous finish-ground piece during this movement, and is located by a stop which is interposed at this point. The controlled-cycle slide then advances the control wheel and work up to the grinding wheel, holds the piece here until the requisite amount of stock is removed and the piece formed, after which the slide (on its return stroke) opens the wheels, and the cycle is repeated.

The ejection of the finish-ground piece by the incoming piece, and the interposition of a stop for locating the latter, presents somewhat of a problem in split-second timing which would be impossible to overcome by manual operation.

FIG. 2. The same magazine from the opposite side.



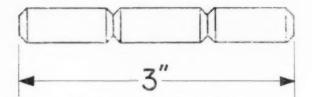


FIG. 3. Type of form-ground workpiece suited to the magazine feed

It will be seen from the diagram reproduced in Fig. 3 that the finish-ground piece is pushed along the workplate until it overbalances and falls into the discharge chute, at which precise moment a stop descends to locate the incoming piece. The operation of the cycle only allows 1½ seconds for the opening of the wheels, the ejection of the ground work, the advance of the new piece, and the interposition of the stop for location of the latter.

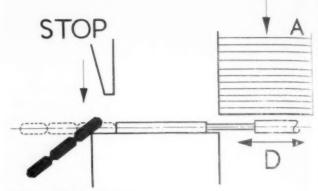


FIG. 4. Principle of operation.

By Edward Diskavitch

Reworking Hardened Tools

THE NEED FOR MACHINING a hardened surface arises most often in plastic mold work. The dies, forces, or cavities used show wear, after an interval, or are damaged, or perhaps the customer buying the product wants a change in the design of the molded article. An outline is presented here of methods of working low-carbon steels as used in these plastic-industry tools, the surfaces of which are hardened

Cutting with tungsten carbide tools, or grinding, are the logical means of achieving the desired results. Often, grinding is not practical because the area to be worked is inaccessible, or the grinding wheel, being small (possibly ½" diameter), cannot be held to the desired shape or size. Then a carbide tool, such as a rotary file, might be just what is needed.

By illustration, in Fig. 1, the six channels of the knob on the force from a plastic mold had to be extended to the base, a distance of about 1". The steel was Samson No. Two (Carpenter) and had been quenched in oil to reach a Rockwell hardness of 59 "C" scale. A tungsten carbide rotary file, turning about 50,000 r.p.m. by an air-motor fastened to a milling machine, as shown, was used in machining. It was held as nearly radial (or vertical) to the arc of the contour

as possible, to avoid bending strain on the carbide burr which, as used on this job, was only ½" in diameter.

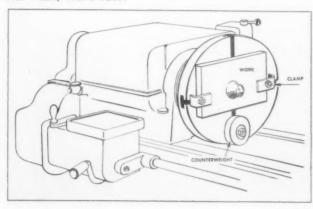
The work was strapped on a rotary table, accurately centered, which made it unnecessary to loosen the clamping bolts after one groove was finished. To start another groove, the rotary table was merely "indexed" to the next position.

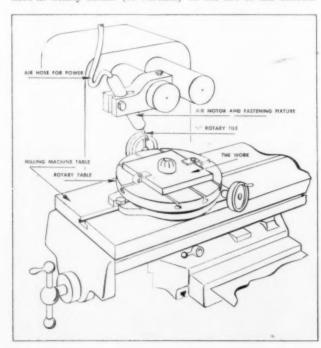
As a second example of machining hardened surfaces, we have the boss milled out of the solid on the force for a plastic mold, shown in Fig. 2, which had been made undersize about 1/16". The force could have been annealed, and an insert remachined by ordinary methods, and then hardened again; however, much time would have been lost, and the cost of the operation would have been considerably greater. The repolishing which conventional methods would have entailed brought out the possibility of a less expensive alternative.

Thus, the work was set up in a lathe faceplate, and the boss trued up. As the arrangement was badly off center, and because the tungsten carbide bit used required a high spindle speed, a counterweight was attached, as shown. Since the metal underneath the protuberance was soft, we drilled through the rest of the way after it was removed. The hole was then ground to fit a replacement plug, which was then shaped to the required, correct contour. The plug was made of drill rod, hardened and tempered, and polished. The flange was to prevent its being pulled out when withdrawing from the mold.

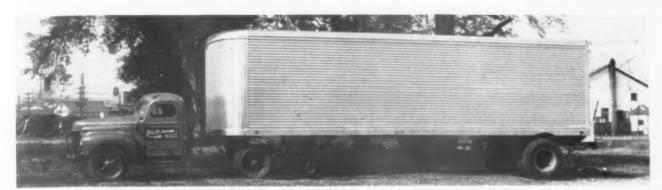
Annealing the force, with subsequent rehardening, might have caused warpage and would have entailed considerable repolishing. As "repaired," however, the plate itself was undamaged, and the job was easily and quickly accomplished.







Automatic Welding Speeds Production of Truck Trailer Bodies



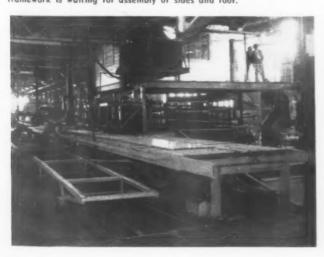
Model "EV" Great Dane Van, single axle. Length of body of this unit is 32'6".

THE ECONOMIES to be effected through the use of modern resistance welding is well illustrated in the case of Steel Products Company, Inc., of Savannah, Georgia, manufacturer of the "Great Dane" line of truck trailers. This company not only claims greatly enhanced uniformity in workmanship and improved weld quality through the use of resistance welding, but a 500 per cent increase in output. The net result has been a marked reduction in unit manufacturing costs despite a general wage increase.

In fabricating the Great Dane trailer body at Steel Products, the large side and roof panels are fabricated from narrower widths of corrugated steel strips. These strips are joined on the machine shown in Fig. 1. The machine is shown from one end of the 32 ft. table, on which the strips are placed, while the dollies shown at the left are used to bring the strip to the machine.

The actual welding is done in the center of this machine, as shown by the close-up, Fig. 2. Here, one strip has been removed to show the arrangement. The strips are lapped, one to the other, and are then guided through the seam welder by the roller-equipped fixtures

FIG. 1. Special-built Progressive full-seam or skip welder used to join side or roof sheets before they are laid on the jig table. The framework is waiting for assembly of sides and roof.



shown on either side. Actual feeding of the work is by the knurled driving or feeding wheels, which are incorporated as part of the welder.

The wheels are water cooled, and welding is at the rate of 20 ft. per minute. Thus, two sections of strip, 30 ft. long, can be welded together in a matter of four minutes. It takes about three strips to form a complete side panel, and another three strips to form a roof panel on this machine.

When the panels have been joined, they go to the traveling and indexing machine shown in Fig. 3. On this machine, which is adjacent to the seam welder, the reinforcing frame members have been laid in place on the table, and the panel is placed over the members and the machine started. The traveling "guns" of the machine, of which the welding head is shown in Fig. 4, make four welds at a time, the head being equipped with dual transformers and designed for series welding. After making the four welds, the guns index over to a new position, across the panel, to make four more welds; thus, a total of 32 spot welds are made in each position of the welding head.

FIG. 2. Close-up view of the Progressive full-seam or skip welder showing welding head and positioning rollers. The machine is self-feeding, electronically controlled and the head water cooled.





FIG. 3. Special-built Progressive projection spot welder used to fabricate the side and roof panels of Great Dane trailers. is air-actuated and positions the assemblies automatically for welding. The table and machine operate in both directions, hence the extremely long layout which, in the photo, extends beyond the field of view.

The table carrying the panel and frame now travels automatically, lengthwise and under the welding head, to a new position on the frame member, whereupon the traveling guns proceed to make another series of welds across the panel. Operation is almost entirely automatic, the only manual operations being to supply the machines with stock and to remove the finished assembly. An air cylinder is used to move the table, while alignment is maintained by the guide rolls, one of which is shown just in front of the operator, Fig. 4.

The equipment, which is furnished by Progressive Welder Company of Detroit, consists of: (1) A Progressive Welder Company self-feeding Universal Seam Welder with 32 ft. table, for fabricating side and roof panels from corrugated strip steel; (2) an indexing and traveling dual-transformer Spot Welder with 32 ft. table for welding side and roof panels to the trailer frame members; and (3) several specially designed and standard Progressive push guns for completing the assembly of the trailer body.

Although quite large, the machines are not particularly complicated, and cost of equipment may be termed quite low in view of the manufacturing savings and the



FIG. 4. Close-up of the Progressive projection spot welder, showing the intricate electronic controls. Four spot welds are made at the same instant, then, the welder tips move across the assembly to a new position, making another set of welds. Action is rapid and precise.

markedly increased output. For example, the machine shown in Figs. 3 and 4 is capable of a welding speed of 250 welds per minute and will assemble an average Great Dane body side in 20 minutes.

While the machines are automatic, to all practical purposes, this does not preclude a more or less universal application to panels of varying sizes. Stops on the machines are readily adjustable from one size to another. However, by reducing-if not entirely eliminating—the human element to a minimum, the welding operations are said by Steel Products to have resulted in remarkably high welding quality and uniformity.

By assembling the sides and roof completely, as described above, the final assembly of the trailer body is quite simple and requires a minimum number of spot welds. These welds are produced with the body in a final assembly fixture using two standard Progressive portable push guns. Fabrication of the body frame proceeds independently of the skin of the trailer and employs two more hydraulic welding guns, also made by Progressive Welder. All of the welding equipment used at Steel Products is electronically controlled.

The Show Calendar

A THE REPRESENTATIVE SOCIETY of the tool engineering profession, the American Society of Tool Engineers naturally welcomes exhibits which bring to the attention of manufacturers the latest and best developments in tools. Large and well attended shows are a hearty sign of an important and thriving industry.

Recent inquiries, however, indicate some confusion on the part of our friends and exhibitors regarding the dates and sponsorship of coming exhibitions of this type. The following listing of coming shows should allay this confusion:

The National Machine Tool Builders' Exhibit (sponsored by the association of that name) will be held in Chicago, September 17 through 26, 1947. On the same dates, and also in Chicago, will be held the Production and Machine Tool Show. This exhibit is not sponsored by the ASTE, as some of the exhibitors have inferred.

The next ASTE Show will open in the Public Auditorium, Cleveland, Ohio, March 15, 1948. This is the only exhibit sponsored by the American Society of Toôl Engineers. Our friends are assured that the Show will be "bigger and better" than ever before. Always a selling show, it will stress, more strongly than ever, the sales interests of exhibitors and will therefore be more productive than ever with respect to orders.

Full details regarding this Show will be sent out as soon as the complete details have been worked out, and every effort will be made to serve the best interests of previous exhibitors as well as the many new exhibitors who will want to be represented at this great ASTE Show.

N. A. F. TO MEET IN L. A.

Keynoted "Invitation to Progress", the 24th annual meeting of the National Association of Foremen, to be held in Los Angeles, Cal., September 18, 19 and 20, will encompass all levels of American management. One hundred panel groups, including foremen, department supervisors, senior executives and directors, will discuss new and practical methods, particularly human relations techniques to promote higher standards of work leadership, improved teamwork, and closer unity within the management team.



Drilling and Boring Tools

Concluding Installment (No. 13) of a Series

In concluding the series on Drilling and Boring Tools, a brief resumé may serve to refresh memory and to clarify any mooted points. As, for example, that accuracy is a relative term and that the degree of accuracy required will depend entirely on the nature of the job, the interchangeability of parts and the required degree of surface finish.

Disregarding punched holes, with which we are not concerned here, the tools used for processing holes are drills, counterbores, reamers, multiple cut and single point boring tools, and laps or hones in ascending order of accuracy and finish. The machines used range from hand or powered portable drills to single, gang or multiple-spindle drilling machines, for drilling and reaming; from vertical or horizontal boring mills, for general purpose work, to ultra-precision jig borers and production machines, for finish boring; and from manually operated or powered laps to engineered honing machines for generating micro-surfaces.

As a rule, bolt holes in mating parts are drilled about 9% oversize ($^{1}\%_{2}$ for % holes; $^{1}\%_{6}$ for % holes), while dowel holes for mating parts may be reamed in assembly with a slight drive fit. Reamed holes, for general purpose work, may run from \pm .0001" to \pm .001" (occasionally

FIG. 1

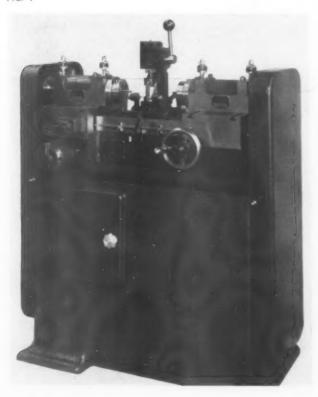




FIG. 2 Above

FIG. 3 Below.

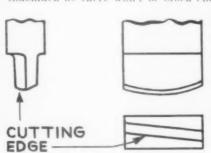


larger) and the surface finish will range from comparatively fine, for rose reamers, to fine for machine reamers and hand reamers. For so-called commercial requirements, the majority of holes are reamed.

Because counterbores usually pilot in drilled holes, counterbored holes are not considered to be, nor required to be, accurate beyond ordinary commercial limits. Where, however, a multi-step counterbore is used, the steps will be reasonably concentric with each other in-asmuch as the leading cutters will act as pilots for those following.

Holes bored with piloted boring bars, whether in drill presses, lathes, turret lathes or boring mills, will be true to size, and concentric, in direct proportion to play in spindles and/or fit between pilots and pilot bushings. Smoothness of holes, in turn, will depend on ratio of spindle speed to feed and, naturally, on the condition of the cutting tool. The less stock that remains for the finish cut, and the faster the speed in relation to feed, the smoother the finish.

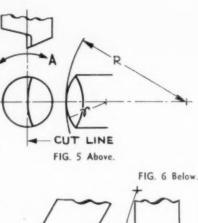
In the case of interrupted cuts, there will be a tendency to jump, leaving a hump on the far side of the interruption and an indentation opposite the interruption. To overcome this, a negative or shear rake cutter may be used; however, this does not serve for the finish boring inasmuch as there won't be stock enough to be bridged

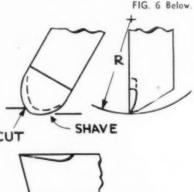


by the tool. In finish boring, where interrupted cuts occur, the tool should be followed by a follower bushing, made of hard wood and a close fit in the bore.

FIG. 4

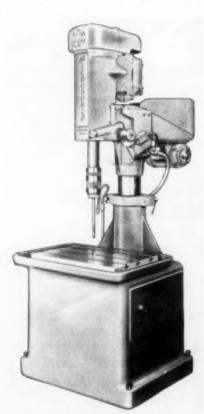
Precision boring is done with a single point tool in precision machines, such as manufactured by Ex-Cell-O Corporation, Heald Machine Company. National Automatic Tool Company or Stokerunit Corporation. These machines, which are designed for carbide or diamond boring, are engineered and built with a view toward ultraprecision and, properly tooled, will reproduce bores indefinitely CUT to any required degree of accuracy of diameter, concencricity and surface





finish. Surface finish, produced in these machines, will be exceeded only by lapping or honing, and in the majority of cases this extra finishing operation is not required. A typical example of these machines is shown in Fig. 1, photo by courtesy of Stokerunit Corporation, Milwaukee, Wis.

While these precision machines are usually provided with specially engineered boring heads and holders, because of the extreme rigidity required, there are a number of commercial boring bars designed for precision



boring. Some are furnished with Morse or B & S taper shanks, others, providing greater regidity, a r e furnished with N.M.T.B.A. tapers. Typical examples are shown in Figs. 2 and 3, photos by courtesy pany, Frankenmuth, Mich. Both of Universal Engineering Comhave micrometer adjustment of

No matter how rigid or how precise the machine, however, it will not produce accurate work unless the fixtures used for holding the work are equally accurate and rigid. In this connection, FIG. 7

rigidity is of paramount importance inasmuch as vibration not only induces chatter, spoiling surface finish, but is especially destructive to carbide and dia-

mond tools.

The shape of the cutting edge, in precision boring, is also important. Actually, a finishing tool should shave or shear rather than cut



to merely remove stock, as in rough or semi-finish boring. This shaving action is best illustrated by the finish planer tool, for steel, shown in Fig. 4. As this tool passes over the work, feeding but a few thousandths per stroke, it produces a threadlike chip almost comparable to the strands that compose steel wool.

A boring tool, based on this principle, can be adapted to boring of steel or some non-ferrous metals. See Fig. 5. Here, a round bit is used, with the radius "r" considerably less than the radius of the bore "R". The cutting edge is ground to a radius and, in operation—i.e., along the cutting line—shaves the material much after the manner of the planer tool previously described. The tool may be rotated, as indicated by the curved line "A", until the best possible finish is obtained.

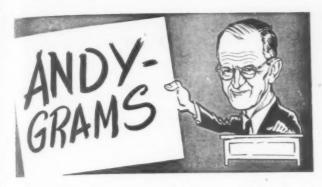
Most finish boring tools, however, are made along conventional lines, as per illustration Fig. 6. When cutting steel, the tool will have a top rake; when cutting brass (as an example) the top may be straight or flat. The tool will cut at the edge and shave along the heel. Naturally, there will be variations for different materials.

Shown in Fig. 7 is one of several machines of the Microhoner line, manufactured by the Micromatic Hone Corp'n, Detroit. These machines generate geometric accuracy, develop any desired surface finish and assure accurate size control. Largely, these machines are used for precision finishing of cylinders—automotive, hydraulic and air, but may be applied to all precision sizing and finishing of bores.

Considerable space has been devoted, in this series, to drill bushings, with an emphasis on rotary bushings for use with boring bars. Like all accessories, however, rotary bushings have their limitations, one of which is that they cannot be applied on close centers. For example, they would not serve for the close clustered holes of the multiple drill setup shown in Fig. 8.

The drill spindles, in the head shown, are crank driven and can be located on very close centers—¾" or less—and, naturally, call for closely centered plain bushings. The setup shown, by Zagar Tool, Inc., Cleveland, Ohio, is particularly interesting because of the simple tooling. The work is held in an index fixture, and clamped with commercial toggle clamps such as made by Knu-Vise and Destaco, both of Detroit.

This concludes the Series on Drilling and Boring Tools. A new Series on Fundamentals of Tool Engineering will start shortly.



Starting in where I left off in July, a/c I had to put the book to bed before leaving, I went to New Haven Chapter's June meeting, as per invitation, there to speak my piece before as live a group of tool engineers as one will find anywhere. Due to commencement, at Yale, all hotels were full up, so Fred Dawless put me up at the Quinnepiac Club. Fred, who incidentally is a cheer leader par excellence, called for me before the meeting, along with Niel Dietler and Bill Learned, and took me for a ride around town and Yale University. Quite a plant!

Arrived at Wilcox's Pier, where the meeting was held, had the pleasure of meeting past Prexies Ray Morris and Frank Curtis, and incumbent keeper of the wampum Vic Ericson, all come to gladden the occasion. Also, New Haven officers Ray Gifford, Alton Pollard, Floyd Brainard and Ted O'Connor. Not so sure about

Sec'y Scholler who, as most secretaries are, was busy

and very much in demand. Quite a gathering of the clan, with everybody happy,

Following some nice talks by the past and present Nat'l officers mentioned above, I was introduced by Mike Radecki, local Att'y Gen'l who is also doing a swell job on the Nat'l Editorial Com'tee. After my talk, which I bulled through somehow a/c Ray Morris got me all flustered just like he did in Hartford, Ch'man Gifford piled up a raft of prizes and delegated me to pull the stubs. And I did; pulled about everybody at the head table, myself included, before the boys out front got a break. Me, I got one of those fisherman's "De-Liars"—a combination scale and rule—at which the wife laughed when I brought it home. She's never seen me catch a fish. Oh, yes, there was one!—but what's the use? You wouldn't believe it if I told you.

During the get-acquainted period, Chapter Delegate Fred Shute advanced what, in my belief, is a swell idea for the coming Semi-Annual in Boston. "The Houston boys put on a barbecue and rodeo for us," he said, "and it went over in a big way. Now, if we could only put on a clambake . . . " Well, now, there's a thought worth sleeping on, and I promised to pass it along. Of course, there's the lateness of the season, and all that, but a

clambake! Oh, memories of halcyon days!

Leaving New Haven, I went to Providence where, on Sunday, I visited Otto Carlborg, under whom I served my apprenticeship back in . . . well, some time ago. In many ways, I consider him one of the most remarkable men I've ever known. A trained engineer and a skilled and versatile mechanic—a tool engineer years ahead of his time—middle age found him stricken with paralysis. Yet, his is a spirit that won't acknowledge defeat, and by dint of will power and perseverance he trained himself to walk again.

During those trying years, he took up wood carving

as a hobby, specializing on birds. By now, he has reproduced practically all of our native birds, and to such nicety of detail that one almost expects them to fly. Oh, yes, he sells them, some as costume jewelry, although at far less than their value in time and money. But, it's a hobby. "Andrew," he said, "as long as a man rides a hobby he is never without an incentive. And it's incentive that keeps us young." Right you are, ol' timer!

While in Providence, visited Langelier Mfg. Co., where I had a pleasant get-together with Sales Mgr. Kaminski and Tony Ward who, it happens, is quite active in Little Rhody Chapter. As in the old days, when I worked there as machine designer among other things, Langelier's is doing big things in the line of automatic machinery. And, to judge by gadgets in process, keeping a few jumps ahead of the times.

As a pleasant interlude, Ed Berry took me under his wing and drove me out to Standard Machinery Company, where I met Prex R. F. Moyer and arranged for material which will come through in a later article. For your info, Standard has a movie on rotary swaring that you boys North, East, West, South might well include in your Chapter programs.

That visit over, Ed took me to his offices—the Berry Engineering Service—where, among other developments, he and his associates are making textile machines do things quite beyond the original concept. A shrewd engineer and a clever designer with lots of "plus", Ed is making good in a big way. Incidentally, he has joined

the growing circle of professional engineers.

Before leaving Providence, called on the Leach Machinery Co., distributors of the Fray All-Angle miller, and at Brown & Sharpe Mfg. Co., where I had a pleasant visit with Sales Mgr. J. P. Burdick. While there, got a thrill of pleasure from the roster of B & S veterans with service records ranging from 60 years down. The list included many old friends and acquaintances from the old days, too many to put down here.

Had intended to call on Federal Products, whose new additions I saw looming on the hill while driving along Allen's Ave., but train reservations being arbitrary, had to content myself with a phoned greeting. And so, au

revoir to New England until next fall.

Got back just in time to attend the meeting of the Michigan Society for Quality Control, where I met a number of old friends and found myself quite welcome generally. Those boys are doing a real job. On my return, had some nice letters from Vic Ericson and Ray Gifford, complimenting me on my talk although, as for that, I always feel myself inadequate to the occasion. After I've sat down, I can think of the most brilliant things I might have said, but then it's too late.

And now, time fugiting and a new deadline approaching, we get ready to put the August book to bed, and that done we clear the decks for the big Machine Tool Show in Chicago. In this game, there's always something interesting in the offing, always the unexpec.... See what I mean? Just then the building next door blew up! Boom!—just like that! Seems a guy was experimenting with chemicals. And that, gentle readers, will punctuate the Column for now.

ASTEely Yours,

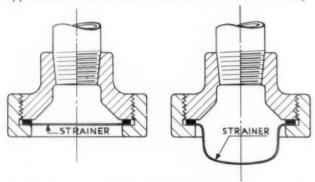
andy

GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Simple Coolant Strainer

A VERY SATISFACTORY STRAINER for coolants or other liquids in circulation, can be made by inserting a screen in an ordinary pipe union as shown in the illustration at left. A spacing ring or collar may have to be used, to compensate for the space ordinarily taken up by the opposite member of the union, which is thrown away.



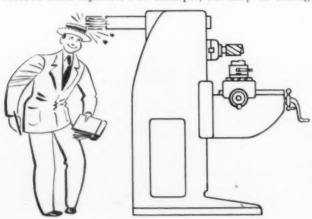
Should more area be required, the strainer can be cupped, as shown at the right; in either event, the screens are quickly removed and replaced, should cleaning be necessary.

Ed Berry, Little Rhody Chapter, A.S.T.E.

Safety Gadget

WHILE ENGINEERS are not inclined to absent mindedness—if anything, they are highly safety minded—they may become so absorbed in a study that surrounding hazards may be momentarily forgotten. This is especially true when working in close quarters amid moving machinery. In such circumstances, one of the best safety devices is the plain, old fashioned, stiff-brimmed straw hat, commonly known as the sailor. Equally efficient, but a scarcer commodity, is the derby, be it brown or black.

While the suggestion may strike the serious minded tool engineers as facetious, the fact remains that the stiff brim crown of either type of hat will act as a buffer against projections and interferences, thus preventing serious head injuries. For example, one may be taking



measurements below table level, on a machine and, in the meanwhile, the table may have moved or the support arm may have been pushed back. Then, on rising, the "fender" takes the impact.

The idea, which was old in grandfather's time, is advanced for the benefit of youngsters who haven't had time to learn by experience—or, shall we say, "bump and try".

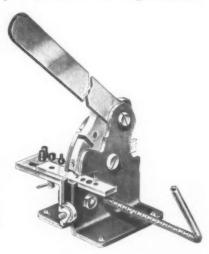
Contributed by Old Timer.

We agree; the stiff hat is an excellent safety device, like the ropes that give warning of "low bridge" on railroads. To complete the picture, we might suggest shoulder pads and shin guards. But that would be facetious, The Editors.

Versatile Bench Tool

A 4-IN-I METALWORKING TOOL, manufactured by Ray Lewis Associates, Inc., Buffalo, N. Y., and marketed by John H. Graham & Co., Inc., 105 Duane St., New York 8, will shear, punch, form and rivet light bar and

rod materials. Called the No. 10 Bench Tool and designed particularly for home craftsmen, this compact, popularpriced tool should also be useful in many plants. Punches and rivet sets, which are made for solid rivets and eyelets, are interchangeable and include 1/8", 3/16" and 1/4" sizes.



Speed and Feed Selector

OFFERED BY Republic Steel Corp'n, Cleveland 1, Ohio, is a circular Cutting Speed and Feed Selector which

quickly gives proper speeds and feeds on 8 types of Republic Enduro Stainless Steel. Form cutting, milling, drilling, and other operations usually performed on an automatic are included. Also, surface cutting speeds are converted to spindle speeds for stock from 0.1" to 8" diameter.



Emergency Stone Drill

An emergency stone drill can be quickly made by serrating the end of a suitable length of W.I. pipe. Use a 3-cornered file, and file teeth about \%6" centers, then use as an ordinary stone drill. With this tool, a hole can be drilled through an 8" brick wall, for \%4" pipe, in about 10 minutes. Hardening is not necessary.

A.S.T.E.



President Visits Western Chapters

Confers with Officers in Eight Cities

N AN extensive Society tour, covering 6500 miles of trouble-free motoring and 2000 miles of flying, President W. B. Peirce reports "hitting every sched-

uled stop on the nose," visiting Chap-ters at Seattle, Wash.; Portland, Ore.; San Francisco, Los Angeles and San Diego, Calif.; Phoe-Ariz.; and Wichita, Kans., besides chartering a new Chapter at Den-

ver, Col., as reported last month. At Seattle Gordon Munro, Chairman; Clyde A. Peterson, First Vice-Chairman; and other members of the Executive Committee, along with Leslie F. Hawes, Los Angeles Chapter Chairman, met at din-ner with President Peirce, June 21. The greatest need of West Coast

Chapters, the Seattle group stressed, is a circuit of outstanding national speakers. Willingness to change their meeting night to conform with such a schedule was indicated by the Washington

On June 24 Mr. Peirce was a guest at Portland's regular meeting, giving a technical talk on making gun barrels. An extended question period followed his address. Earlier in the day, he met

with the Executive Committee, headed by William E. Brennan, Chairman.

The President's next stop at Golden Gate Chapter was the occasion for an Executive Committee meeting June 28 at the Athens Athletic Club. Mr. Peirce outlined his program for increasing membership and discussed plans for improving the functioning of the organization. Chairman Floyd V. Snodgrass and First Vice-Chairman E. C. Holden were among the eight officers present.
Each of the committeemen present

commented briefly on local and national problems, Mr. Peirce offering helpful

suggestions.

University May Offer T.E. Courses

Another group of Chapter officials at Los Angeles convened with the Society's chief executive, July 3. The President's hosts included Leslie F. Hawes, Chairman; Anton Peck, Past Chairman; R. G. Stronks, First Vice-Chairman; and G. J. Walkey, Second Vice-Chairman. The Chapter reported success in their efforts to interest a local university in setting up tool engineering courses.

Among suggestions submitted by R. W. Peters, Chairman; V. A. Petricola, Second Vice-Chairman; and other members of the San Diego Chapter Executive Committee was a proposal for an annual meeting of Chapter Chairmen

regionally, or nationally at Detroit, with National Officers in attendance.

The Southern California representatives, in their conference with Mr. Peirce July 7, also expressed enthusiasm for an inter-Chapter bowling league, matches to be played in the respective Chapter cities, with results announced by wire.

In Phoenix on July 8, President Peirce attended an Executive Committee meeting of Chapter officers enthusiastic about the prospects of building their membership, which suffered in the loss of wartime industry. Harry E. Rives, Chairman; R. G. Andrews, Secretary; and Carl J. Weingartner, Treasurer, were among the group who entertained the President

Circuit Speakers Urged

The next day Harold Bales, Chairman; L. R. Glassburner, First Vice-Chairman; E. G. Johnson, Second Vice-Chairman; M. M. Ross, Past Chairman and National Membership Committeeman, and several other officers assembled at the Coleman Co. for a discussion of Chapter problems. Here, too, as in all the other groups visited, the Chapter executives expressed a desire for organized itineraries featuring top flight

President Peirce found the far West Chapters flourishing despite postwar adjustments and membership transfers. Throughout the remainder of his administration, he plans to visit as many others as possible, to assist them with their problems and the coordination of their activities with the national

program of the Society.

Host Chapter Develops Plans for Boston Convention

Local arrangements for the Semi-Annual Meeting to be held at Hotel Statler, Boston, October 30-31-November 1, are already well under way, John X. Ryneska, Boston Chapter Chairman, reported at a recent joint meeting of his committee and the National Program Committee.

Mr. Ryneska serves as Host Chap-r General Chairman instead of Arthur A. Nichols as erroneously reported to The Tool Engineer.

Mr. Nichols is the National Program Committee's liaison in correlating the national and local convention details.

Under Mr. Ryneska's capable leadership, special surprise features are being planned for the Society's entertainment in one of the nation's oldest cities. The revised and corrected list of committee chairmen assisting Mr. Ryneska includes: W. W. Young, Assistant General Chairman; Henry A. Hudson, Emergency; John L. Morosini, Signs; James N. McHoul, Tickets; A. D. Forbes, Co-Chairman, Entertainment; Wilfred B. Wells, Accommoda-tions; and J. B. Savits, Co-Chairman,

Nearly completed by National Program Chairman Robert W. Ford and his committee is the six-session technical schedule.

The entire convention program is expected to be announced in detail in the September *Tool Engineer*.

Second Anniversary Sees Doubling of Membership

Cedar Rapids, Iowa-"What's New in Turning Equipment" was the subject of a technical discussion by S. A. Brandenburg, Sales Manager for the Monarch Machine Tool Co., at a recent meeting of Cedar Rapids Chapter in the Montrose Hotel.

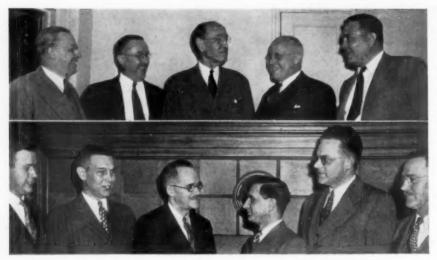
His talk was supplemented with slides and a short motion picture illustrating many of the unique and incredible operations performed on a lathe.

Mr. Brandenburg also presented interesting data on speeds and feeds and gave a preview of coming machine tool developments.

R. E. Choate, President of LaPlant-Choate Mfg. Co., Inc., and local civic

Cedar Rapids Chapter had this fine turn ary celebration in the Montrose Hotel. During its brief existence, Chapter has doubled membership





Four Society Past Presidents gather around the present incumbent, W. B. Peirce, at Hartford Night in that city. From left, top: R. M. Lippard, J. R. Weaver, Mr. Peirce, Frank W. Curtis, and Ray H. Morris. Below: Edmund Morancry, Immediate Past Chairman, is greeted by his successor, Richard Smith and other officers. From left: D. B. Huntting, Secy., Clayton Parsons, 2nd V.-Chm., Mr. Smith, Mr. Morancey, W. F. Jarvis, 1st V.-Chm., and James Fitzgerald, Treas

leader, gave an after dinner talk, "Socialism in England," including highlights on British production methods and training in industry Mr. Choate's speech was based on first-hand observations made during a recent visit to England and the continent.

A feature of the meeting marking the second anniversary of the Chapter's chartering was the presentation of a Past Chairman pin to M. J. Fitzgerald, Chief Tool Engineer of Collins Radio Co., by J. M. Speck, first Chairman of the group.

R. A. Hruska, present Chairman, briefly reviewed the Chapter's beginning and growth from the original 53 members to its present membership of more than 100.

Lennart N. Dahlen and W. Z. Fidler, Chairman and Past Chairman, respectively, of Tri-Cities Chapter, were quests at the meeting.

Lou Named to Thew Post

Lorain, Ohio—Nils H. Lou, former Factory Manager for The Glenn L. Martin Co., Baltimore, Md., has been appointed Assistant General Works Manager by The Thew Shovel Co. The post, newly created to help cope

The post, newly created to help cope with operating problems, includes direct control of plant layout, expansion and maintenance, tool purchases, production engineering, tool room and crib, as well as power plant and maintenance. Mr. Lou will take an active interest in such physical problems as methods and cost reduction.

During his association with the Martin company, begun in 1929, Mr. Lou was twice Chairman of Baltimore Chapter, ASTE, and a National Director of the Society.

Park Promoted by Ford

Windsor, Ont.—William P. Park of Windsor Chapter, ASTE, has been appointed Production Superintendent of the Body Plant, Ford Motor Co. of Canada, Ltd.

A native of Scotland, Mr. Park has been associated with the Ford company for 22 years, recently as Asst. Supervisor of Time Study.

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Hage Expands Company

Toledo, Ohio—Albert Hage, President of Hage Industrial Corp., has announced the opening of a new plant in Pemberville, Ohio.

The company designs and builds special tools and gages and manufacturers parts for production in other industries. Organized two years ago, the present firm has outgrown its original location in Toledo.

Mr. Hage, the company head, is Chairman of Toledo Chapter, ASTE.

Russia Dims Peace Hopes Says Nurnburg Official

Hartford, Conn.—Russia's plan of world domination is following the same pattern as the Nazi scheme of aggression, according to Thomas J. Dodd, former Executive Assistant to Chief Prosecutor Judge Jackson at the Nurnberg Trials.

On his return from Germany, Mr. Dodd told 306 members and guests of Hartford Chapter at the recent Hartford Night Dinner, he was optimistic about permanent peace. But this hope is daily receding, he added, with the political helplessness of the increasing ring of Soviet satellite nations.

Describes Nazi Atrocities

The speaker gave a stirring description of the war crimes trials and briefly mentioned some of the unbelievable horrors revealed and proved beyond question

Other speakers included ASTE President W. B. Peirce who outlined in detail the Society's varied activities and its part in the nation's industry.

I. F. Holland, First Vice-President, announced plans for a regional meeting of New England Chapters, as well as the Semi-Annual Meeting at Boston this fall.

William C. Stauble, Executive Vice-Pres., The Holo-Krome Screw Corp., acted as toastmaster and introduced those at the speakers' table.

Among guests present were: Staunton Williams, Pres., The Capewell Mfg. Co.; R. J. Ahern, Pres., The Billings & Spencer Co.; James R. Weaver and Frank W. Curtis of Springfield and R. A. Lippard of Worcester, Mass.; all Past Presidents of ASTE; W. P. Gwinn, Vice-Pres. and Gen. Mgr., United Aircraft Corp.

Sixten Wollmar, Pres., Hartford Empire Co.; V. H. Ericson of Worcester, Mass., National Treas., ASTE; H. M. Toppin, Pres., The Jacobs Mfg. Co.; and F. K. Simmons, Pres., The Henry & Wright Mfg. Co.

Several acts of professional entertainment concluded the program.

East Siders Victorious In Annual Contest

Rockford, Ill.—Bait casting, horseshoe pitching, golf driving, dart throwing and other competitive contests opened the annual stag picnic held by Rockford Chapter, June 14, at Svithiod Park near Rockford.

In the next event the East Side successfully challenged the West Side to a softball game.

Throughout the afternoon refreshments were available to the tired contestants.

Following dinner, served by a local caterer, Kenneth Lund awarded the numerous attendance prizes, assisted by Earnest Seborg, Chairman, who served as general chairman for the outing.

Several out of town guests participating in the fun boosted the attendance to approximately 115.

The picnic concluded the season's activities until the first Thursday in September.

Linsley Guest Speaker at I.P.E. Meeting in England

Wolverhampton, Eng.—H. E. Lin-sley, Machine Tool Editor of The Iron Age and a member of the National Program Committee, ASTE, addressed the Institution of Production Engineers, Great Britain, at a meeting held

July 19 in Wolverhampton.

Mr. Linsley, who represented ASTE at the invitation of the English organization, read a message of good will from W. B. Peirce, Society President, and presented on his behalf a framed copy of the ASTE Code of Ethics. Stressing the common principles subscribed to by the peoples of both nations and their interchange of technical knowledge in the prosecution of the war program, Mr. Peirce, in his greeting, offered the facilities of ASTE to its British counterpart.

After a speech of acceptance by Rt. Hon. Lord Semphill, Mr. Linsley, a native of England and a citizen of the United States, read a paper, "The Ma-chine Tool and You."

In this address, he reviewed the development of industry from the day of the hand craftsman to the projected workerless factory of the future, pointing out that each new stage of mechanization, has, through the agency of machine tools, created rather than displaced employment.

Following a reception held by Mr. Linsley, he was a guest at a banquet in the Star and Garter Hotel, where he was officially welcomed by The Right Worshipful The Mayor of Wolver-

hampton.

Guests of honor at the dinner included the Mayoress, Lord and Lady Semphill, Major and Mrs. Thorne, the American Consul, Mrs. H. E. Linsley and Mr. A. Linslev.

At the opening session of the technical meeting, Mr. Linsley was intro-duced by E. W. Hancock, Past Presi-dent of the Wolverhampton Section,

Pittsburgh, Pa. — Herman C. Dicome, formerly of Cleveland, has been appointed Plant Engineer by Ed-

win L. Wiegand Co., manufacturers of Chromalox heating units, according

Mr. Dicome, a member of Cleveland Chapter, ASTE, was previously asso-ciated with the Erickson Tool Co.

Dicome with Wiegand

to a recent announcement.

I.P.E., who attended the ASTE Annual Meeting in Cleveland last year, pre-senting an Honorary I.P.E. Membership to the Society's President.

Resistance Welding Shown As Modern Joining Process

Los Angeles, Calif.-Jig, fixture and production design, special machines for mass production, processing, and costs entering into resistance welding were discussed by Arthur D. Lewis and Howard Dally, speaking before the June 12 meeting of Los Angeles Chap-

The lecture was illustrated with a new General Electric motion pic-ture "Resistance Welding Controls." Through the film sequences the audience learned about various modern methods of joining by resistance welding, such as projection welding which makes possible the assembly of complex parts in one operation with a minimum of electrode maintenance, and seam welding which produces a continuous joint, much like a sewing machine.

The speakers pointed out that the absence of heat distortion is one of the advantages of spot welding, especially when toggle clamps are used to prevent

the parts from shifting.

After the technical talk, Dr. J. Lowell Henderson, Executive Director of the Learn and Like It Foundation, presented "Blueprint for Success."

Basic factors of success listed by Mr. Henderson are: 1. Selection of a major goal, determination of a plan, and putting the plan into action; 2. The ability learn. All skills and abilities, he claimed, are acquired, as qualities of mind vary little at birth. Ability, he added, is in direct proportion to the capacity to remember.

Emphasizing association and visualization as the two principles of learning. the speaker declared that we remember things seen 22 times better than those

heard

With the aid of his assistant, Charles Holmes, Mr. Henderson gave a memory demonstration. Numbered words suggested by the audience and recorded on a blackboard, unseen by Mr. Henderson, were immediately correlated when either the word or number was called from the floor.

Kansas City, Mo .- Norman L. Spelman, President of The Spelman Co., demonstrated "Seal-Peel," the resinous heat-softening plastic in which many products and cutting tools can be dipped for permanent protection, before a meeting of Kansas City members June

Plastic Coating Protects Tools, Peels Readily

During the demonstration an egg, dipped, coated and dropped approximately five feet, was not injured but bounced like a rubber ball. The same results were achieved with a glass bottle. A coating of approximately .030" or was claimed to be ample protection against weather, rough handling, acid and oil. Peeling with the fingers removes the coating when desired, the speaker stated.

"Mathematics for Tool Engineers" was presented by Fred Epperson of the Aireon Mfg. Co. and First Vice-Chairman of the Chapter. With blackboard drawings, Mr. Epperson explained the use of logarithms as a tool to eliminate multiplication and provide a portable

calculator.

Films shown included "Development of the Rolls Royce Engine," a Packard Motor Car Co. production, and "To New Horizons," sponsored by General Motors Corp.

Golfers Have Field Day

South Bend, Ind .- A golf tournament featured the annual summer outing of South Bend Chapter, held June 21 at the Indian Lake Country Club.

Low score of 80 was attained by George Froin, with Bill Shineman as runner-up. Top winners in the blind igey were Howard Palmer and Frank Deitle. High score of the afternoon was turned in by Norman Smith with 148.

John Rieck, whose lucky shot off the second tee sliced across the road out of bounds, hit a tree and bounced back on the green to within a few feet of the hole, was awarded a prize for being nearest the pin on his tee shot.

First prize winners in the horseshoe contest were John Kovach and Harry Keller, Edgar Helm and Ray Fearhily taking second place. William McCombs and Miles Royer were the euchre champs. Climax of the day was the presentation of the numerous prizes.

Dinner at Timberline Inn was enjoyed by the 185 members attending the

Standards Secretary Visits New England Chapters

Detroit, Mich .- In accordance with the tentatively-inaugurated Chapter visitations by the ASTE National Standards Committee Secretary, S. F. Girard called on the New England Chapters at Springfield, Worcester and Boston, Mass.; and Hartford, Bridgeport, and New Haven, Conn., during the latter part of July.

As a result of Mr. Girard's visits,

steps have been taken toward the layout of new data sheets, according to W. H. Smila, National Standards Chairman. It is expected that Mr. Girard will personally contact many more Chapters before the Semi-Annual Meeting in Boston this fall.



Leslie Hawes (left) Los Angeles Chapter Chairman, gives Memory Expert Dr. J. Lowell Henderson a workout prior to his address, "Blueprint for Success," before the Chapter. At right is Charles Holmes, Assistant to Dr. Henderson

Tool Engineers' Handbook

Biographical Briefs

Punch and Die Design Authors Committee

Jay Bowen, Chief Eng. for McReynolds Die & Tool Co., Detroit, chairman of the Punch and Design Authors Com-mittee for the Society's "Tool Engi-neers' Handbook." An authority on dies, Mr. Bowen received a thorough grounding in die engineering with leading die

Left:

the author of numerous articles on in 1923, applying his ability to die decarbide applications, and an active member of the Wire Association.

Otis T. Hamby, Gen. Master Mechanic, Dodge Div., Chrysler Corp., Detroit, followed a machinist's apprenticeship at Pittsburgh Plate Glass Co. with associations at American Car and Foundry Co. and in several tool and die shops before becoming Asst. Foreman of the Chrysler Die Shop in 1921. After several promotions, he was appointed to his present post five years ago.

Armed with a General Electric apprenticeship and an M. E. degree,

A. E. Glen

O. T. Hamby

"Motor Body Blueprint Technology," he has contributed to technical articles

John H. Meyn, Master Mechanic as the DeSoto Plant of Chrysler Corp., Detroit, secured a thorough Old World training in his profession, graduating from Technikum College, Hamburg Germany, and serving an apprentice ship there. In this country he has been engaged in tool and die designing at several automotive plants and as Chief Engineer for Paramount Eng'g Co.

L. A. Mulligan, Product Eng., at Ternstedt Mfg. Div. of General Motors Corp., Detroit, brings to the Handbook more than a quarter-century of engineering and development of moldings and decorative interior trim stampings for automobiles, including product design and experimental engineering. Previous associations include Troy Sunshade Co., Zenite Metal Co., Joseph N. Smith Co. and Martin-Parry Corp.

A native of Halifax, England, Donald Pickles, Supt. of Production Eng'g, Ford Motor Co., Dearborn, Mich., came

F. K. Kirsch

G. T. Koch



E. C. Clifford

Below, J. Fredericks

Top, Jay Bowen













N. L. Kenerson



L. A. Mulligan



J. H. Meyn



Donald Pickles



E. N. Sorensen



John Rometty

concerns. He joined McReynolds in 1927, is a member of Detroit Chapter, ASTE, and the Eng'g Society of Detroit.

Elliott C. Clifford, Chief Die Eng., DeSoto Motor Corp., Detroit, was in-strumental in developing and producing the first all-steel auto body in the "Flanders 20." Many of today's accepted industrial standards have had their foundation in experiments conducted and standards developed by Mr.

John Fredericks, Tool and Die Supt. at Chevrolet Gear & Axle, Detroit Div. of General Motors Corp., has spent 30 years in engineering, processing, de-signing, building and developing dies and special machines for making sheet metal stampings. His service with Chevrolet extends over a score of years.

Arthur E. Glen, Mgr. of Die Sales, Carboloy Co., Inc., Detroit, has been associated with the development of carbides since their introduction in this country in 1928 when he joined Carboloy. He has been responsible for many pioneer carbide die installations, is

Norman L. Kenerson went to Detroit in 1923, applying his ability to die designing, estimating, and sheet metal stamping. Last year he closed a 16-year association with Allied Products Corp. as Vice-Pres. in Charge of Eng'g Sales to join Stewart Process Co. in an executive capacity.

Frank K. Kirsch, who operates the Erie Engineering Co. at Detroit, brings to a concern specializing in designing and dies for sheet metal stampings a wealth of experience acquired during 24 years in the stamping business. Half of this period was spent as Chief Die Designer with Briggs Mfg. Co. While with Wales-Strippit Corp., he helped develop patented standard dies.

After 17 years' association with the Murray Corp. of America, which he terminated as Master Mechanic, George T. Koch, Pres., Engineering Service, Inc. of America, Detroit, entered a partnership. Registered as a Professional Engineer in 35 states, Mr. Koch sponsors at his plant a refresher course in engineering instructed by a university professor. Co-author of

to the U.S. as a youth, receiving his engineering education in various schools of the Ford company. Subsequently he became Die Design Eng. in the Rouge Plant, Body Div. During the war, he had charge of tool design for the B-24 bomber at Willow Run.

Detroit's automotive industry lured John Rometty from Ashtabula. Ohio, where he had served an apprenticeship. Courses in die design and engineering occupied his leisure hours during his employment with Detroit Body Die Co. Leaving this concern as Foreman and Shop Supt., he spent two years with Midwest Engineering Co. before making his present connection with McReynolds Die & Tool Co. as Shop Supt.

E. N. Sorensen, Chief Designer of Nash-Kelvinator Corp., Detroit, began a long association in the automotive industry as a die designer at Dodge Bros. and Michigan Stamping Co. Then came 14 years as Chief Die Designer at Murray Corp. and eight years with Packard Motor Car Co. as Chief Designer on dies, fixtures and welding equipment.

Welding Makes New Strides Complicated Designs Cut

Cleveland, Ohio-R. H. Davies, Consulting Engineer for The Lincoln Elec-tric Co., addressed Cleveland Chapter at a meeting held lately in the Hotel Allerton. His subject, "Latest Develop-ments in Welding," was illustrated in part by a color-sound film entitled "Distortion.

Important factors discussed in connection with welding included distor-tion, design and new work. Distortion, the speaker said, may be reduced in several ways such as skip welding, step back welding, welding away from point of restraint and toward the point of maximum freedom, clamping, and heat treating. All these methods tend to reduce locked up stresses and warping, he added.

Experience has shown, Mr. Davies stated, that the most effective and economical approach to redesigning for arc welding is to change one part at a time, a gradual transition that is simple and inexpensive.

In designing for welded steel construction, he warned, the functional requirements should be borne in mind, with no attempt made to duplicate conventional construction. Steel plate, bars, angles and any other standard shapes may be used.

Definite advantages of welded construction on new work he cited as lower design and material costs, elimination of patterns and greater freedom of

Mr. Davies pointed out that welding will open many frontiers, and welding as we know it now will be obsolete in ten years, with new electrodes and new types of automatic welding being developed every day.

Grimm, Officer at J & L

Springfield, Vt .- Walter J. Grimm, Assistant to the General Manager, Jones & Lamson Machine Co., has been elected company Secretary. Mr. Grimm is a member of Twin

States Chapter, ASTE.

With Ease on New Lathe

Muncie, Ind .- By means of an ingenious cam operated tool actuating device applied to an especially designed engine lathe, the cutting of diamonds, flutings, chains, daggers, stars, rosettes and many other patterns becomes a purely routine assignment.

In fact, an endless variety of designs can be produced with a single elemental record cam, S. E. Beers, Special Sales Representative for the Monarch Machine Tool Co., demonstrated to Muncie Chapter members in a film illustrated lecture given at the Chapter's June 11 dinner meeting in the YMCA.

The motion picture presented details of the making of molds for plastic and glass products. Among these was a souvenir ash tray requiring an esti-mated 492 hours to make by conventional methods the molds which were turned out in less than 24 hours on the Shapemaster lathe.

Other sequences of the film showed the use of the lathe for turning and boring square and irregular shapes.

Frank Heap, Manager of the Indianapolis branch of the Monarch company, assisted Mr. Beers.

SITUATION WANTED

MANUFACTURING MANAGEMENT Seasoned mechanical executive engineer seeks permanent connection with progressive organization. Experience includes materials management, maintenance, mass precision production and jobbing work, process planning, tool design, tool making, plant layout, assembly operations, forge shop, stamping and press grey iron and malleable ies. Details and references room. and references foundries. furnished to responsible parties stating their requirements. Address reply to Box 119, American Society of Tool Engineers, 1666 Penobscot Bldg., De-troit 26, Mich.

Tells How to Fully Utilize Cold Work Die Steels

Philadelphia, Pa .- "Getting the Most Out of Cold Work Die Steels" was explained by Dr. Gurdon M. Butler, Jr., Associate Director of Research, Aliegheny Ludlum Steel Corp., to more than 150 engineers attending a recent dinner meeting of Philadelphia Chap-

Tracing the evolution of steels from straight carbon water hardening, through manganese and tungsten oil hardening types to oil hardening high carbon-high chromium steels, Dr. Butler described advantages, drawbacks, applications and processing of the various types of tool steels.

Cooperation of the heat treater, he stressed, is important in the successful production of tools as is correct tool design. Sharp corners, thin and thick sections, holes close to edges, deep tool marks and hand stamping are starting points for cracks, the speaker warned. Care in grinding, he added, must be exercised to prevent cracks.

Films shown in connection with the talk pictured the electric furnace melting of high carbon, high chrome steel and the making of carbide shapes for dies and parts.

At the close of his lecture, Dr. Butler conducted an interesting open discus-

Picnickers Brave Elements

Columbus, Ohio-In spite of inclement weather, 85 members and guests of Columbus Chapter fared forth for the annual picnic, June 14, at Valley Ranch near West Jefferson.

Varied entertainment was provided in the full schedule of events planned by Program Chairman Paul O'Brien and his committee. Impromptu group singing and guitar solos were rendered during the supper hour.

Prizes were awarded in a spirited manner by Howard Volz, Chairman of the Prize Committee.

Dr. Gurdon M. Butler, Jr., Associate Director of Research, Allegheny Ludlum Steel Corp., and Arthur R. Diamond, Philadelphia Chapter Chairman, 7th and 6th from right at speakers' table, respectively, chat during dinner which preceded Dr. Butler's address on die steels. Other Chapter officers are seated at head table



Strain Gage Tests Show Punch Press Energy Losses

Los Angeles, Calif.-Given Brewer, Consulting Engineer of Laguna Beach, presented one of Los Angeles Chapter's most informative programs in a recent report on electric strain gage tests and analyses as applied to a 30-ton Diamond punch press.

Mr. Brewer stated that these tests, employing the newest methods of electrically locating and analyzing stresses to the latest types of Western-made punch presses, resulted in modifications of designs with a 38% reduction of stress in the frame.

In the experiments, the speaker continued, strain gages were applied to approximately 200 different locations on the press from which distribution of stress was recorded under various loads.

Electric strain gage testing was defined by the speaker as a method of electrically measuring the shortening or lengthening of the part being tested.

Mr. Brewer's dynamic tests demontrated that, of the 88% of flywheel total energy released in one of the test runs, only 181/2% of the total energy went into the work.

Of the energy released by the fly-wheel during the stroke, 80% went into friction losses. Although the friction coefficients in the bearings seem moderate, it is obvious, Mr. Brewer pointed out, that if friction could be reduced 35%; the amount of energy absorbed by the work could be doubled.

The entire lecture was precise, scientific and well illustrated with slides showing setups and charts. A lively discussion period followed.

Dinner Dance Closes Season

San Francisco, Calif. - Technical subjects were pushed to the background to make way for the dinner dance of Golden Gate Chapter, held in Oakland, June 10, with approximately 100 members and guests attending.

During the evening Mrs. Reno Butanno and some male groups rendered vocal selections.

The social event terminated the Chapter's activities until September.

Production Die Casting Duplicates Skilled Work

St. Louis, Mo.-Approximately 150 members and guests of St. Louis Chap-ter heard J. C. Fox, Chief Metallurgist, Doehler-Jarvis Corp., discuss Die Casting at a meeting June 5 in the Melbourne Hotel.

Mr. Fox emphasized that the principle of die casting is basically woven into the field of tool engineering in that the die maker's skill is duplicated over and over by unskilled workers in the production process of die casting.

Slide films were projected on the screen to give technical and metallurgi-cal points of the "how" and "why" of die casting. These were followed by the sound film, "Introduction to Die Castproduced by the New Jersey Zinc Co. and illustrating early methods and improvements in die casting machines.

Interesting shots were shown of actual die making and products formed with the dies. The speaker pointed out that the machines are only as good as the materials used in the production of

Peck Forms Own Company

Los Angeles, Calif. - Anton Peck, formerly of Jamison Steel Corp., has organized Peck's Steel and Die Supply. The new concern will handle Jessop tool steels and related items.

An active member of Los Angeles Chapter, Mr. Peck is Delegate and a Past Chairman of the Chapter. Nationally he serves on the Editorial Com-

SITUATIONS WANTED

COST REDUCTION - Young Mech. Eng. proficient in the field of metal manufacturing seeks short or long term contract. Extensive experience in carbide engineering, tool engineering for job lot or mass production, wage incentives, designing. Housing shortage no obstacle. Address replies to Box 120, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

Given Brewer (center), Laguna Beach consulting engineer, is dinner guest of Los Angeles Chapter before delivering his lecture on electric strain gage tests. At left and right are: Leslie Hawes, Chm., and Anton Peck, Delegate



Obituaries

William F. Bretschneider

William F. Bretschneider, 59, President of the Machinery and Engineering Service Co., St. Louis, Mo., died suddenly of a heart ailment at his home June 4

Mr. Bretschneider, an ASTE member since 1940, was formerly co-owner of the Mill Supply and Machinery Co. of St. Louis, and also spent a number of his earlier years with the Norton Co.'s Midwest sales organization.

Guy Hamilton, Sr. Guy Hamilton, Sr., 73, Nashville, Tenn., manufacturer's agent, was fatally injured in a recent automobi's accident on the Nashville-Chattanooga Highway near Martin Springs.

Born in Pontiac, Mich., Mr. Hamilton went to Nashville about 25 years ago where he had since been engaged as a manufacturer's agent, with the exception of several years' service as Treasurer of Precision Parts Corp.

At the time of his death, Mr. Hamilton was Chairman of Nashville Chap-ASTE, and a member of National Association of Power Engi-

Alfred H. Lefave

Alfred H. Lefave, for 19 years foreman of the Crankshaft Dept., at General Motors Corp. of Canada plant in Windsor, Ont., died recently in Grace Hospital there after a brief illness.

A popular member of Windsor Chapter, ASTE, Mr. Lefave was also affiliated with St. Andrews Lodge 642 A.F.& A.M .. Walkerville Lodge 348 I.O.O.F. and Othmar Grotto, Ancient Order of

Describes New Type Auto

Fort Wayne, Ind .- Advantages in design and operation of the new Tucker automobile, being readied for production, were described by Dr. Kenneth Lyman, Technical Advisor to the Tucker Corp., speaking before the June 11 dinner meeting of Fort Wayne Chap-

Lively interest was evident from the many questions asked Dr. Lyman at the close of his talk.

Howard Mills, Sales Manager of The Bellows Co., Senacon Div., followed Dr. Lyman with a technical lecture on the use of air power in industry. A film was shown in connection with the talk.

Approximately 125 engineers attended the meeting.

200 Enjoy Golf Frolic

Toledo, Ohio-Toledo Chapter's Annual Golf Frolic, held June 11 at the Highland Meadows Golf Club, opened with a blind-par tournament, about 60 participating.

Following a buffet luncheon served in the early evening, prizes were awarded to the lucky golfers. A number of attendance prizes were also distributed.

Motion pictures, featuring Houston convention highlights, local sporting events and garden scenes, were shown by Director A. M. Schmit. Approximately 200 were present at the outing.



Despite midsummer heat. Cincinnati members turned out 300 strong for the Chapter's Ninth Annual Dinner. Left, group seated, from left: W. B. Peirce, President, George R. Squibb, Chairman, Professor William E. Smith Chairman, Department of History.

Miami University, and Norman P. Auburn. Vice-President, University of Cincinnati (speakers). Standing: George H. Simond, Second Vice-Chairman, Lorin Hayden Past Chairman, Henry Bruewer, Secretary, and Chester A. Peters. Treasurer

Permanent Peace Hinges on Understanding Among Masses

Cincinnati, Ohio—Whether or not there is a growth of understanding of human relations among the middle classes of Russia and America within the next quarter century will determine the alternative of lasting peace or world oblivion, according to Professor William E. Smith, Chairman of the Department of History, Miami University, Oxford, Ohio.

Professor Smith, speaking on "The Challenge of This New World," addressed 300 members and guests of Cincinnati Chapter at their Ninth Annual Dinner, June 7, at the Cincinnati

"We must become accustomed to thinking in terms of two world powers—two spheres of influence—not seven as there were formerly," said Professor Smith, referring to the United States and Russia.

"The other five," he continued, "have receded as a result of the Second Thirty Years War, 1913 to 1945, which has left two young, energetic, victorious nations. And lasting peace can be had only when these two nations have established the frontiers of their spheres of influence and amicably recognize them as such."

Vice-President Norman P. Auburn of the University of Cincinnati introduced Professor Smith. W. B. Peirce, President of ASTE, spoke briefly concerning the educational systems of our colleges, dealing principally with the particular economic viewpoints held forth in the books adopted by some of these institutions.

Prominent industrial executives and educators who were guests at the function, included: Millard Romaine, Asst. to the President, The Cincinnati Milling Machine Co.; William P. Winters, Chief Designer, American Can Co.

Howard Pearson, Industrial Engineer, Williamson Heater Co.; A. C. Wais, Vice-President, General Machinery Corp.; E. A. Muller, Chairman of Board and Treasurer, The King Machine Tool Co.; Charles E. Gilbert, Jr., Secretary, The Cincinnati Gilbert Machine Tool Co.; C. L. Reichert, Asst. Works Manager, The Cincinnati Bickford Tool Co.; Judge James G. Stewart.

George Langen, President, The Cincinnati Planer Co.; Robert D. Hines, Asst. Dean of University Administration, University of Cincinnati; Fred Choefler, Vice-President, Lodge and Shipley Machine Tool Co.; and Albert Kullman, Vice-President and Works Manager, The American Tool Works Co.

Flinn, Publicity Assistant

Springfield, Vt.—Henry B. Flinn, a member of Twin States Chapter, ASTE, has been made Assistant Publicity Manager for Fellows Gear Shaper Co.

Mr. Flinn, who has been associated with Fellows for the past 30 years, was formerly in the Machine Development and Service Dept.

Office athletes limber up with baseball and horseshoe agmes at Cedar Rapids Chapter's annual summer outing



Ladies Night Dance

Windsor, Ont.—More than 200 members, wives and guests attended Windsor Chapter's Annual Ladies Night dinner and dance at the Lakewood Golf and Country Club, June 13.

Following dinner a number of prizes were awarded to the ladies, each winner being permitted to choose from the gifts displayed.

Dancing followed with more prizes for couples caught in pre-designated spots. Impromptu quartets also entertained from time to time.

Gray Iron Founders to Meet

Cleveland, Ohio — The Gray Iron Founders' Society, national trade association of gray iron casting manufacturers, will hold its 19th annual convention at Hotel Schroeder, Milwaukee, Wis., October 2-3.

Local foundrymen will act as hosts for the national group. George E. Tisdale, Secretary-Treasurer of the Zenith Foundry Co., West Allis, Wis., is chairman of the local committee on arrangements.

Major subjects for discussion at this gathering of foundrymen will include marketing, cost reduction and labor problems.

95 Attend First Picnic

Erie, Pa.—A warm, sunny interlude in the onslaught of June rains favored Erie Chapter for its first annual picnic held on the 21st at the General Electric Picnic Grounds.

Approximately 95 members and guests participated in the program of mushball, golfing, fishing, swimming, horseshoe pitching and other games.

Prizes were awarded to the champions of the various events. A number of attendance prizes were also distributed.

Iowa Group Holds Outing

Cedar Rapids, Iowa—Seventy members and guests attended the first annual stag party of Cedar Rapids Chapter held June 18 at the Mayvu Pavilion.

The fun began with a before dinner, muscle stiffening ball game between two teams composed of members and guests. Others present at the outing competed at horseshoes.

After dinner, attendance prizes were awarded and card games enjoyed.

Coming Meetings

BOSTON—October 30-31, November 1, ASTE Semi-Annual Meeting, Hotel Statler.

BUFFALO-NIAGARA FRONTIER—September 13, Annual Picnic, Walker's Grove, Williamsville, N. Y. Visiting members invited.

CHICAGO—September 24, Dinner and technical session in conjunction with Machine Tool Congress. Furniture Club of America.

Denver—September 3, Oxford Hotel. Speaker: R. O. Anderson, District Manager, Norton Co., Worcester, Mass. Subject: "The Manufacture of Grinding Wheels" illustrated with film.

PONTIAC—August 21, Afternoon Golf Outing at Forrest Hills Country Club. Dinner in the evening.

Toledo Yacht Club. Speaker and subject to be announced.

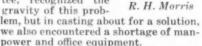
Builders of A. S. T. E. Ray H. Morris, President, 1943-44

In the following article, the eleventh of a series by former heads of the Society, Mr. Morris relates the highlights of his year in the presidency.

MY TERM as President came at a time when the spirit of ASTE was most prolific. There certainly was no lack of enthusiasm insofar as membership was concerned, but there was

dire need for adequate Headquarters facilities to properly service the rapidly increasing number of Chapters, and to efficiently supplement the activities of National Committees.

The National Officers, comprising the Executive Committee, recognized the



While Headquarters facilities and personnel were being expanded to meet these needs, the Executive Committee decided that Chapter visitations by the National Officers were necessary in order to explain the situation which the Society faced. I visited about 25 and chartered four or five Chapters while President.

Incidentally, the time, effort and means required to prepare an itinerary reaching from coast to coast, border to border and beyond, with travel conditions as they then were, would be a story in itself.

Monthly Checkups

To capitalize on the information which we garnered from these visits, it was necessary for the Executive Committee to meet practically every month. Compilation of this data indicated certain definite revisions in Society function.

To begin with, the complexion of the Board of Directors changed materially each year. Without much preparation, the Directors met twice a year and acted on various problems.

Often these actions resulted in amendments to the Constitution and By-Laws, and before all of us were aware of it, our "rules of the game" became so riddled with inconsistencies that Chapters found it difficult to cooperate effectively. Moreover, the long Board sessions resulted in voluminous minutes difficult to interpret and effec-

On the advice of members experienced as officers in other organizations, I proposed that we establish a Resolutions Committee to screen recommendations received from Chapters prior to Board meetings. The idea was immediately accepted. To this Committee I appointed members grounded in both Chapter and National assignments.

They met a day prior to the Directors Meeting, with instructions to study resolutions received and to submit their recommendations to the Board. This procedure eliminated much debate in the Board meeting, the next two ses-

sions requiring less than eight hours of deliberation.

The enthusiasm with which this departure from precedent was received encouraged us to establish the Organization Progress Committee to prepare a revised Constitution and By-Laws and to devise procedures by which properly organized effort, with full understanding and interpretation of the rules, would govern the actions of National Committees and Chapters. National Officers.

In our selection of this Committee, we concentrated on members who had shown unusual talent in interpretation of their duties as Chapter Officers, National Committeemen and Directors. It is pleasant for me to look back now and note that every member of this Committee has been or is now a National Officer.

Magazine Status Misunderstood

Another matter which Chapter Officers mentioned frequently during our visits was the status of our magazine, The Tool Engineer. These comments indicated a deep loyalty and appreciation for our publication, but very few really understood that the Society's benefit from this activity was purely aesthetic.

Paying serious heed to our tenet. that no one individual or group of individuals, should derive personal profit at the expense of the Society's membership, negotiations were carried on with our publishers for greater control of and profit participation in the proceeds of our publication. This task was long and strenuous and confronted other administrations, but finally culminated in success for the Society.

To aid the National Program Committee in their efforts to assist Chapters in preparing their meeting programs, a library was set up at National listing recommended Headquarters, speakers and subjects.

The National Education Committee made noticeable progress with colleges and technical schools in establishing tool engineering courses.

Handbook Publication Begun

After a year or two of research and survey, the Handbook Committee was given the green light by the Board to proceed with the publishing of a Tool Engineering Handbook.

Under the experienced guidance of now President W. B. Peirce, the Na-tional Membership Committee continued to build our membership and, in a definite way, determined the proper interpretation of qualifications membership.

In retrospect, it seems to me that my administration was responsible for only a trend in the direction of progress and good Society management. The Executive Committee consisted of men whose assistance I certainly appreciated and whose counsel and guidance proved to be wise.

Chairmen of the various National Committees gave freely and willingly of their time to a cause which seemed thankless. This brings to mind the manner in which I inveigled Past President Sargent into accepting an appointment to the Organization Progress Commit-

Quite by accident, I met him at a gathering in a New York Hotel. During the convivialities of the evening. he accepted the appointment. Perhaps, as Al says, I did take advantage of him. but it is my personal conviction that from the manner in which he has since served the Society will come much of its future success.

Contacts with members and particularly with Chapter Officers. National Committeemen, Directors and Past National Officers, continue to prove to me that we have a lot of latent but competent and unselfish ability among our members, which guarantees the continued success of ASTE. The friend-ships which resulted from contacts with these individuals, I will always consider as compensation in full for the time and effort expended.

Cast Iron Metallurgy, Heat Treat Discussed

Richmond, Ind .- A. William Schneble, Jr., of the Advance Foundry Co., Dayton, Ohio, gave the technical address at the June 10 meeting of Richmond Chapter in Morton Center.

His discussion of the Metallurgy of High Strength Cast Iron included the various structures found in gray iron and their relation to the physical properties of the material.

Mr. Schneble described also the effect of the various structures on the heat treatment of cast iron.

The Chapter's \$100 scholarship award was presented during the evening to James Sweet of Cambridge Ind., by Dezell Gibbs, Chairman of the Education Committee.



Photo courtesy Richmond-Palladium Item James Sweet, Cambridge City, Ind., high school grad-uate receives Richmond Chapter's engineering scholar-ship from Dezell Gibbs, Chapter Education Chm. From left: Mr. Sweet, Robert Gilbert, Supt., Cambridge City schools; Lowell Penland, Chapter Chm.; and Mr. Gibbs

Mr. Sweet, who was accompanied by Robert Gilbert, Superintendent of Cambridge City schools, is enrolled in the class entering Purdue University next fall. His selection for the award, based on scholastic merit, potential engineering ability and citizenship, was determined by a committee composed of Mr. Gibbs, Lowell Penland, Chapter Chairman; his predecessor, Jesse Johnson; and Howard Haworth, Education Chairman for 1946-47.

BULLETINS AND TRADE LITERATURE

Items briefed herein have been carefully selected for their interest and application. Unless otherwise stated, all are available, free, from the stated sources.

ALLEGHENY LUDLUM STEEL CORP'N, 2020 Oliver Bldg., Pittsburgh, Pa., recently released three colorful and informative booklets, each devoted to the rise and importance of a particular industry and its use of stainless steel. The industries covered are Petroleum, Dairy, and Meat.

INDUSTRIAL CARBIDE TOOL CO., 33 Hermon St., Worcester 8, Mass., has available a new *Price List of Single Point Tools*, from solid carbide rod, for use with Heald and Ex-Cell-O Boring Machines.

Bulletin 471, issued by THE READY TOOL CO., 550 Iranistan Ave., Bridgeport 5, Conn., describes the Red-E Ball Bearing Centers, designed to maintain extreme accuracy with carbide cutting tools at high speeds, or for precision grinding operations. Bulletin 472 describes the standard line for use with high-speed steel cutting tools.

Catalog 103A, listing a wide variety of standard plastic instrument knobs, industrial control balls, and pointer and lever knobs, is available from KURZ-KASCH, INC., 1451 South Broadway, Dayton I, Ohio.

Precision Equipment for Angular Setters is a new catalog issued by ROBBINS ENGINEERING CO., 318 Midland Ave., Detroit 3. Tools included are the Magna-Sine and the Univ-Angle, magnetic tools for holding workpieces at any desired angle; the Sine Plate, which is non-magnetic and has tapped holes for holding work, and Sine Bars, for angular inspection work and set-ups.

AJAX ELECTRIC CO., INC., Philadelphia 23, Pa., will mail its 72-page Booklet 116, covering Salt Bath Heat Treating and the Ajax-Hultgren Salt Bath Furnaces, upon request on company letterhead.

NORTON COMPANY, Worcester 6, Mass., has published a comprehensive, pocket-sized handbook on Grinding Carbide Tools, Section titles include Wheels for Grinding Carbide Tools, Grinding Single-Point Tools, Chip Breakers, Hand Honing, Grinding Multi-Tooth Cutters, Miscellaneous Grinding Operations, How to Get the Most from Your Diamond Wheels, Centralized Control and Grinding, and General Information, From this list, the value of the 138-page book may be readily seen. Its usage will be greatly increased by the spiral binding, by which the book will lay flat at any page for easy reference.

Another recent publication of the NORTON COMPANY is a 32-page booklet and price list on Norton Grinding Wheels for Foundries, Steel Mills, Forge and Welding Shops, a handy guide for selection of the right abrasive for any rough grinding job.

The Tri-Bit Cutter Manual, listing high production, inserted blade, metal-cutting tools, has been issued by WED-DELL TOOLS, INC., 37 Centennial St., Rochester 11, N. Y.

The CINCINNATI SHAPER CO., Cincinnati, Ohio, has available a 32-page General Catalog N-3 on its complete line of shapers—rapid traverse, universal, utility, high-speed, and railroad. The 64-page Catalog B-2 describes the line of Cincinnati press brakes.

ROCKFORD MACHINE TOOL CO., Rockford, Ill., lists its complete line of Hy-Draulic planers, shapers, slotters, and shaper-planers in Catalog 1947. The Rockford Hy-Jector molding machine, mentioned in "News" in the Plastics World, of the July Tool Engineer, is fully described in Bulletin 147.

SURFACE COMBUSTION CORP'N, Toledo 1, Ohio, has released a new 16-page Booklet 8C-134 on Modern Gas Carburizing, describing the related processes of suspended carburization, carbon restoration, and dry cyaniding, and the equipment used,

CANEDY-OTTO MFG. CO., Chicago Heights, Ill., announced recently a new catalog, Insert #90, giving detailed specifications of its complete Drill Press line. Single and multi-spindle models feature positive, single V-belt drive, tilting motor bracket, and stepped cone pulleys for quick speed changes; sliding heads; slotted and tilting tables.

CHICAGO RIVET & MACHINE CO., 9600 W. Jackson Blvd., Bellwood, Ill., has released a 48-page catalog on Chicago Rivet Automatic Setting, fully describing its engineering service, special rivets, and the many floor and bench model machines for fastening light mass-production assembly items. Equipment is available for fastening metal, wood, fabric, leather, or composition, or any combination of these,

DU MONT CORP'N, Greenfield, Mass., is offering a 12-page bulletin on *Minute Man Keyway Broaches and Sets*, listing its complete line of Broaches, bushings, and arbor presses for hand broaching of keyways.

A new catalog has been announced by the ADAMAS CARBIDE CORP., 1819 Broadway, New York 23. Included in the new literature is a large list of carbide cutter blanks.

The How Book of Cost-Cutting Material Handling, published by THE VALE & TOWNE MFG. CO., 4530 Tacony St., Philadelphia 24, is just what the name implies. This 70-page book presents many storage and production floor problems in material handling, and illustrates by means of simple clear drawings how these may best be met—with modern material handling equipment furnished by Yale & Towne. The use of the Yale & Towne Vis-O-Graf Summary is fully explained, and samples are enclosed, enabling the reader to make a complete survey and analysis of the conditions existing in his own plant.

DIAMOND PRODUCTS, INC., Elyria, Ohio, lists its many diamond pointed and diamond impregnated dressing tools in a new catalog. Diamonds for Industry, "How Lubricants Affect Cutting and Grinding" is an interesting article in a recent issue of Oakite News Service, bimonthly house organ of OAKITE PRODUCTS, INC., 157 Thames St., New York 6, Helpful data is provided on the characteristics of straight cutting and soluble oils, dilution ratios, types of wheels to be employed under various conditions, and proper control of fluid stream. Along with other helpful information are recommendations of avoiding wheel loading and glazing.

ACME SCIENTIFIC COMPANY, 1448 W. Randolph St., Chicago 7, Ill., describes its unique service of mirrorfinishing plastic mold surfaces in a fourpage folder, Acme's New Mold Polishing Service.

Linde Methods in Steel Production is a 48-page vivid portrayal of the many steel industry practices which employ oxy-acetylene flame equipment by THE LINDE AIR PRODUCTS CO., of Union Carbide and Carbon Corp'n, 30 E. 42nd St., New York 17.

The new Wyco Catalog of flexible shaft equipment is now available from WYZENBEEK & STAFF, INC., 838 W. Hubbard St., Chicago 22. A number of completely new Wyco products are described, including the Wycomatic Speed Changer, a variable speed flexible shaft machine, instantly selective to any desired speed.

THE NATIONAL SUPPLY CO., Box 899A, Toledo 1, Ohio, has issued Bulletin No. 344, describing its Ideal Type "F" Swivel for drilling oil wells to moderate depths.

A new full-line G-47 Catalog is announced by CHICAGO METAL HOSE CORP., Maywood, Ill., manufacturers of flexible metal hose. This organization has coined the term "Flexonics" for the controlled bending of thin metals for use under varying conditions.

The First Industrial Directory of Mexico has been published by ROLLAND PUBLICATIONS, under the sponsorship of the Confederation of Industrial Chambers of Mexico. A feature of this 1024-page volume is a list of all Mexican industrial companies, their addresses, capitalization, executives and department heads, products manufactured, raw materials used, and employee strength. Along with each copy will be a special Spanish-English Dictionary designed to enable U. S. readers to most efficiently use the publication. The first edition, for 1947-1948, may be obtained for \$20 (postpaid to any point in the United States) from Publications Rolland, S. de R. L.; Plaza de la Republica No. 6-407; Mexico, D. F.

TRABON ENG'G CORP'N, 1814 E. 40th St., Cleveland 3, Ohio, has a 12-page Bulletin No. 469, describing its complete line of oil and grease pumps for manual, automatic, motor-driven or mechanically-driven operation.

GOOD READING

A Guide to Significant Books and Articles of Interest in the Trade Press

THE CHEMISTRY AND TECHNOLOGY OF PLASTICS, by ASTE member Raymond Nauth, Consulting Engineer, is a highly practical book for engineers working with plastics. In addition to discussing all the major types of plastic materials, there is a particularly complete section on mold design, presses and other equipment. Especially valuable is a very detailed and interesting chapter on resin-bonded plywoods. The properties of wood and adhesives are described at some length, as well as the manufacture of such laminated structures as boats, aircraft bodfes, and gliders.

Unlike many technical books, Dr. Nauth's work is readily used, his clear and cohesive writing being supplemented by numerous structural formulas showing the chemical changes involved in reactions and processing, tables of physical properties and other pertinent information, many explanatory illustrations, and an abundance of helpful charts and diagrams. Dr. Nauth's 540-page volume is a welcome addition to the Reinhold Plastics Series, and is available at \$9.50 per copy from the Reinhold Publishing Corp'n, 330 West 42nd St., New York 18.

The Second Edition of MANUFAC-TURING PROCESSES by Myron L. Begeman, Professor of Mechanical Engineering, The University of Texas, includes new chapters on Special Casting Methods, Powder Metallurgy, Hot Forming of Metals, and Cold Forming of Metals. In addition, the chapter on Plastic Molding has been rewritten as has the chapter on Welding and Allied Processes.

In all, this 615-page textbook is a handy source of basic information on the more important manufacturing processes, engineering materials, and the machine tools necessary for processing these materials. It is available at \$5 per copy from John Wiley & Sons, Inc., 440 Fourth Ave., New York 16.

The Sixth Edition of MATERIALS MANDBOOK, by George S. Brady, with all information brought up to date, can be extremely valuable to engineers, purchasing agents, and others in industry. Part I lists alphabetically the accepted names of countless metals, plastics, fabrics, woods, lubricants, gasses, chemicals, and other materials. For each, much specific data is given—sources, chemical composition, physical properties, and principle uses. Group classifications of materials for the most part offer comparative data on the various classes of material within the groups.

Part II is miscellaneous reference information, ranging from economics and geophysics of materials through tables showing electrical conductivity of elements used in alloys and other extremely helpful tables, charts, and lists. Mr. Brady's 789-page, quick-reference handbook is available at \$7.00 per copy from McGraw-Hill Book Company, Inc., 330 West 42nd St., New York 18.

60 YEARS WITH MEN AND MACHINES, the well-heralded story of Fred H. Colvin, editor emeritus of American Machinist, is a "must" for every engineer. Author of more than 40 technical books, Fred H. Colvin's autobiography is not alone a mere recording of the events in which he himself figured but, more importantly, an unusual history of the progress of men and machines in many fields of endeavor... a history that reads as smooth as fiction.

Possessed with a rare sense of humor, the dean of technical journalism has so injected his own personality and that of his acquaintances into this novel-like documentation that the reader feels akin to the great inventors, engineers, and others known intimately to the author.

Particular attention must be directed to the author's recording of the rise of technical journalism and the part it has played in the development of modern industry. In the past, there has been some debunking of the saga of the Wright brothers, who have received much of the glory associated with the early history of aviation; but, Mr. Colvin has many elucidating observations on the subject, and particularly on the controversy concerning the Pierpont Langley claim of building the first heavier-than-air machine capable of flight.

Other chapters portray the part machine tools played and did not play in World War I, and the greater importance placed in World War II on the machine tool industry as an adjunct of great military strength. These are but a few highlights of this exceptional book, written by an engineering writer long associated with one of our so-called competitive publications, Mr. Colvin's book is available at \$3.50 per copy from Whittlesey House, McGraw-Hill Book Co., Inc., New York 18.

The Third Edition of AIRCRAFT MATERIALS AND PROCESSES, by George F. Titterton, Ass't Chief Eng'r, Grumman Aircraft Corp'n, represents many years of painstaking research. This thoroughly revised book presents the latest essential information on materials and processes used in the manufacture of aircraft.

Briefly, Mr. Titterton's work covers testing methods, heat treatment, shaping of metal, metal-joining processes, and a thorough discussion of all types of materials-their chemical composition, physical properties, heat treatment, and adaptability for various aircraft purposes. Materials described include steel and its alloys, nickel alloys, copper and its alloys, aluminum alloys (wrought and cast), magnesium alloys, wood and glue, fabrics and dope, plastics, glass and other transparent materials, and natural and synthetic rubber. This 340-page book is available at \$4.75 per copy from Pitman Publishing Corp'n, 2 W. 45th St., New York 19.

THE BLUEPRINT LANGUAGE OF THE MACHINE INDUSTRIES, by Harry Cecil Spencer, Prof. of Technology, and Hiram E. Grant, Assoc. Prof. of Engineering Drawing, Washington University, is intended as fundamental training in blueprint reading. It will, however, be an important aid to any beginning engineer, and should be a good refresher course for many more-experienced engineers. As a textbook for apprentice-training programs, it is excellent, being a thoroughly practical book.

The authors have drawn on more than one hundred major industrial concerns in selecting typical problems and illustrations. There is no "purely theoretical" information: every drawing has been taken from an actual commercial blue-print. Each chapter outlines certain fundamental principles. Text matter is exceptionally well illustrated. Following each chapter are worksheets, based on the "completion problem" idea. Special cross-section grids are provided to permit the working of the problems by students without any marked ability in sketching.

A considerable number of facsimile reproductions of commercial prints are included at the end of the book. These present a broad view of the practices of various companies. Worksheets with questions, and grids for sketching, accompany the blueprints. This well-written textbook is available at \$5.00 per copy from The Macmillan Company, 60 Fifth Ave., New York.

EXPERIMENTAL CASTING PLASTICS, by Thomas A. Dickinson, ASTE member, author of "The Plastics Dictionary", and frequent contributor to The Tool Engineer, is the result of an intensive experimental research program. The book combines the advance-information features of an exclusive but costly engineering report with the usefulness, distribution, and resultant low cost of a technical reference book designed for popular reading.

The book in general is devoted to formulae and simple new methods of making rigid or flexible patterns, molds, and casts—from plastics or for use with plastics. The processes are simple and economical enough to be used in any workshop, large or small, and the data should be of equal value to the home craftsman and the factory engineer. While only 30 pages, the book is set in small, and closely-spaced type and provides a wealth of ideas, since information available elsewhere has been eliminated and is referred to by bibliographical notations.

Sources of materials and equipment are given for the convenience of those who would like to experiment further. The book is available at \$2.00 per copy from *Plastics Research Company*, Alhambra, California.

TOOLS OF TODAY

Pneumatic Gages

Merz Engineering Company, 200 S. Harding St., Indianapolis 7, Ind., announces a complete line of pneumatic and taper gages, known as "NEW-MATIC." An exclusive "reversed-flow air control, featured in all five models, provides both a calibrated measurement scale of the required magnification and a "zero" adjustment for returning the calibration to a basic value. To provide extreme accuracy, the New-Matic Gages are equipped with continuously variable and adjustable orifices, making possible the control both of air volume and pressure and providing "balanced air" for high-precision measurement.



Actual measuring machines as well as comparators, with variations from standard dimensions shown in graduations to meet customers' requirements, these gages are made to fit inspection requirements of every type. The Merz "Versatile," shown at left, provides a normal scale covering .004" and magnification of approximately 1,000/1, while the "Master," shown at right, offers a standard calibrated scale for any required magnification up to 20,000/1.

T-8-1

Torque Measuring Device



Airdraulics Engineering, Inc., New Canaan, Conn., announces the new Model SDB-25 BEAM SCALE, a torque measuring device used for checking the accuracy of torque screw drivers, wrenches and other torque tools, and to test and adjust power tools. This tool, which is accurate to a fraction of an inch pound, with a standard capacity of up to 25 inch pounds, enables manufacturing plants to set up torque standards and torque specifications on all fastenings. The tool is chromium plated, light in weight (103/4 lb.), demountable, easy to operate, attractive in appearance and can be delivered from stock.

T-8-2

New "Tukon" Tester



The Wilson Mechanical Instrument Co., Inc., 230 Park Avenue, New York 17, N. Y., announces a new heavy load Model LR "TUKON" TESTER, said to be the ultimate in a hardness testing machine and recommended for light and heavy load testing. The tester contains all the refinements for testing with either the Knoop Indenter, used for tests from 25 grams to 3600 or 5000 grams, or the 136° Diamond Pyramid Indenter (Vickers type), used for tests from 25 to 50,000 grams. Loads of 10,000 grams are furnished as standard equipment; loads from 10 kg to 50 kg are accessories.

Improved Panelboards

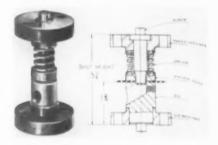
An improved Federal Noark NTPS PANELBOARD, for control of light and small power circuits, has been announced by Federal Electric Products Co., Newark, N. J. It is available in 4 to 12 circuits, flush or surface mounting. The shallow depth of the steel enclosure $(3\%_8")$ is a particular advantage for flush mounting in walls.

The toggle-switch assembly now incorporates a steel tension spring, which assures positive electrical contacts by exerting constant pressure on stationary contact parts.

T-8-4

Punch and Die Set

A new line of low shut height, interchangeable self-stripping PUNCH AND DIE UNITS, by Raar Mig. Co., 1663 N. Highland, Los Angeles 28, Calif., features low initial cost, low shut height (3½"), air slug ejection, and close hole centers. Simply constructed and completely salvageable, the die units come in a wide range of hole sizes from 1/32" to 1-1/32".



Stripper and stripper guide are removable by a half turn and, since the punch may be removed from the retainer with a slight pressure, change or replacement is easily effected without disturbing the setup. The die, which may be rotated to provide clearance for the slug ejector opening, is tapped for air pressure connection.

T-8-5

Lightronic Gage Head

An ELECTRONIC GAGE HEAD with multiple stations, developed by the Yankee Precision Products Company, 50 Bartholomew Ave., Hartford 6, Conn., is a self-contained unit and operates direct from 110 volts, 60 cycles, single phase current without the use of an electronic control cabinet.



Combinations up to 14 stations are available, each recorded by lights and each having individual adjustment for tolerance setting. Accuracy of setting between lights is .000005", with tolerance range between the low and high limit .015". One gage spindle—which is frictionless and the only moving member—operates all lights. This gage head can be mounted on any special gaging fixture or on standard "Yankee" gage frames and stands.

T-8-6

LeMaire Takes Grinder

The patents and manufacturing rights of the Sunstrand 3-WHEEL GRINDER, formerly manufactured by the Sundstrand Machine Tool Company of Rockford, Ill., have been acquired by the LeMaire Tool & Manufacturing Company, Dearborn, Michigan. The new owner will service any of these grinders now in the field and is prepared to furnish any replacement parts.



T.8.2

Throttling Type Valve

Among the newest developments by Air Associates, Teterboro, N. J., is the throttling type HC-3600 UNLOADER VALVE, expressly designed to provide pressure regulation, at 3600 psi operating pressure, without the usually severe shock loads that accompany the cut-in and cut-out action of most units.



Cut-in procedure of the valve is exactly the opposite from other types of unloaders, which operate downstream with the flow, in that the poppet travels "upstream," to shut off the by-pass flow thus automatically cushioning movement, since the dynamic flow opposes the movement of the poppet.

The HC-3600, which weighs only 11 ounces, may be used with or without an accumulator, and will handle up to 20 gallons per minute flow without an excessive amount of pressure drop. At 16 gpm, the pressure drop is within the limits prescribed by Specification AN-R-6. The HC-3600 may be used with variable volume pumps, as well as the constant delivery type, at extreme temperatures of minus 65 deg. F. to 165 deg. T.

Tee

New Carbolov Dies

Carboloy Company, Inc., Detroit, has introduced a new line of standard SQUARE AND HEXAGONAL SHAPED DIES provided with larger bell openings. The new dies may be finished to cover a range of hole sizes from 5/32" to 15/8" for the square dies, and from 5/32" to 17/8" for the hexagonal. They allow greater latitude in the angle at which stock may enter.





The enlarged bell opening provides for more lubricant for the entering stock and reduces the amount of extraneous stock which must be removed from the entering angles when making up a finished die from the rough shape. In addition, the improved design allows readier access to the internal die contours, thus materially expediting finishing and service; however, both finishing and maintenance is performed with the same equipment used for previous Carboloy dies.

T-8-9

Tool Post Turret

A new TOOL POST TURRET, known as Model L-4½, designed especially for the LaBlond Dual Drive Lathe, has been announced by Enco Manufacturing Company, Chicago, manufacturers of tool post and tailstock turrets and Hexturrets. The new turret provides extreme rigidity for carbide tipped tools, which are supported by a flat base and clamped with at least three screws. Maximum tool size for this model is 5% x 1".



A quick set-up for threading is provided by 12 station, 30 degree indexing, and each tool mounted has 3 different working positions. An equalizer spring keeps the tool block and clamping lever in constant contact, eliminates chip interference and makes indexing quick and easy.

"Standard" Die Sets

All-steel DIE SETS, in a complete range of sizes and suited to all presses, are now offered by Standard Machinery Company, Providence, R. I. All parts are accurately bored and ground, and die shoes, punch holders, pins and bushings are interchangeable from stock without rework or fitting. Back pin Die Sets, stocked for immediate shipment, are listed in Catalog Section DS, available on request.

Carbide Tipped Reamers

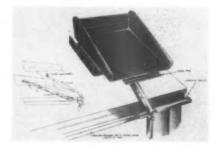
Super Tool Company, 21650 Hoover Rd., Detroit 13, has standardized its line of Flute Long CARBIDE TIPPED REAMERS, now available in 32 sizes from ½" to ½". Running the full length of the flutes, the carbide tips serve as long wearing guides and prevent reamers from freezing up in bushings due to galling. Chips are more easily cleared, thus preventing loading in the flute and scoring of the finish; furthermore, the reamers maintain sizes longer, making close tolerances possible over a longer period.



T-8-12

Wayne Drafting Tray

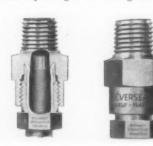
A spacious, easily accessible place for the designer or draftsman's working tools and accessories is provided by the floating WAYNE DRAFTING TRAY, by A. Wayne Nunemaker & Assoc., 103 S. Wells St., Chicago 6. Cadmium-plated mounting bars are quickly installed, and the crackle-lacquer finished tray is easily moved to any desired location on the drafting table.



T-8-1

Self-flaring Fittings

The assembly of a tube connector fitting and a leakproof 37° flare can now be obtained in the same operation, with Everseal SELF-FLARING FITTINGS. Made by Everhot Products Co., 2001 W. Carroll Ave., Chicago 12, these brass fittings will flare steel tubing, as well as copper, aluminum, monel, or Bundyflex, without splitting or distorting the tubing.

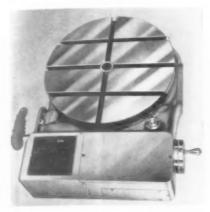


The fitting is complete in two parts—fitting and nut. The "sleeve" end of nut forces end of tubing into an annular recess of the fitting. Continued tightening extrudes tubing into a perfectly flared seal that will withstand a pressure of more than 8,600 pounds. The new line includes straight connectors, elbows and tees.

T-8-14

Single-Unit Rotary Table

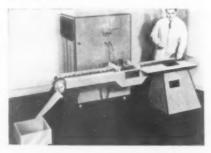
ROTARY TABLE, by W. B. Knight is whinery Co., St. Louis, Mo., is quickly a apted to milling machines, shapers, or a rizontal boring mills for power rotary milling or precision indexing work. Sugle-unit and electrically driven, this table virtually eliminates set-up time, since no extra equipment or power connection to the machine is required. Just page it in.



Eighteen feed changes, from 1½ to 54" per minute are provided on the 20" diameter table, with optional feed range of 3 to 108" p.m. also available. Other features include a simplified system of changing feed gears, graduations in minutes as well as degrees, T-slots machined from the solid, and anti-friction bearings throughout.

New Conveyor Belt Table

Lepel High Frequency Laboratories, Inc., 39 W. 60th St., New York 23, announces a new CONVEYOR BELT TABLE for use in conjunction with any Lepel high frequency unit or other make of induction heaters, for efficient handling of work parts for brazing, soldering, annealing, or hardening.



The application shown is the annealing of the top edge of hardened steel wedges, 4" long and ¼" thick, for the purpose of reworking. 1,800 pieces per hours can be annealed with the Lepel 15KW unit shown in the background.

The conveyor belt, which permits the fastening of interchangeable supports to hold various shaped work parts in place, is power by a ¼-HP motor, and belt speed may be regulated over a wide range to accommodate a variety of applications. The load coil, shown in the center, is movable and can be placed at the extreme left of the conveyor belt for hardening applications, at which point the part can fall directly into a quenching tank.

T-8-16

Rotary Base Table

By Leo G. Brown Engineering Co., 1127 Riverside Drive, Los Angeles 31, Cal., an extremely low priced Rotary Base Two-Way SLIDING TABLE with base graduated to 360°. A feature of this table, which adapts it as an unusual slide rest, or as an auxiliary milling table, in addition to other applications, is the 7½" x 7½" top surface which is mounted on two screw equipped slideways with 6" travel set at 90° to each other. Feed screws are graduated. Two clamping screws, in the base, securely locks the table at any angle. Over-all height is 4½", weight 35 lbs.

T-8-17



Lifetime Gage Blocks

Fonda Gage Company, Stamford, Conn., announces that LIFETIME-CAR-BIDE GAGE BLOCKS are now available to users of square gage blocks. This new addition to the Fonda line is said



to represent the first time that a full range of sizes, in square style gage blocks, have ever been offered in carbide.

The new square style blocks are being manufactured in both

Grade "A" $(\pm.000004")$, and Grade "B" $(\pm.000008")$ quality. Individual blocks range in size from .050" to 4.000"; and complete sets are made up of 35 and 82 pieces. Special sizes will be made upon individual quotation.

Fonda Square Lifetime-Carbide Gage Blocks are guaranteed, by the maker, not to grow or shrink over any period of time. They possess the highest resistance to corrosion, are extremely wear-resistant, and are said to outlast, by test, more than 100 steel blocks, and retain their original surface finish longest. Also, their flatness and parallelism remain constant under all working temperatures.

T-8-18

Non-Loading Coolant

A grinding coolant—WHEELYFE 85,—developed by the Bee Chemical Company, 63 East Lake Street, Chicago, is a clear solution which, it is claimed, will not load the wheel even with the finest grit sizes.

Because of freedom from loading, the finish is determined by the grit size used and is not the mirror finish obtained by the buffing action of a loaded wheel. This coolant sinks chips well, gives proper corrosion protection, and will never become rancid. The recommended dilution for best results is 1 gallon of WHEELYFE 85 to 30 gallons of water.

T-8-19

Induction Heating Unit

The Tocco Division of the Ohio Crankshaft Company, Cleveland, Ohio, announces a new addition to its line of induction heating machines—a 750-watt 450,000-cycle TOCOTRON. This is a bench type machine designed primarily for silver brazing and soldering, but also adaptable to hardening, annealing and forging applications within its power capacity.



The new low-cost unit is of the tube oscillator type, operates from a 110/120-volt A. C. single-phase 60-cycle current source and is tapped to accommodate either single or multiple-turn inductor coils. A revolutionary feature is the fact that the new unit requires no water connections,

This small unit, which is suitable for both automatic or manual operation, is designed to operate continually at full load for mass production work, yet, is readily adaptable to quick set-up changes required by job-shop or tool room operations. Inductor coils can readily be made by simply forming copper tubing or wire to the required shape.

T-8-20

Grinding Attachment

Designed primarily for precision external grinding on South Bend Lathes, an electric GRINDING ATTACHMENT, by the South Bend Lathe Works, So. Bend 22, Ind., is also easily adapted to other makes of lathes, milling machines, shapers, and planers. The 4" x ½" grinding wheel is driven by a constant-speed, continuous-duty ½ HP motor, permitting heavier sustained cuts. The grinding wheel spindle runs on pre-lubricated, sealed ball bearings.

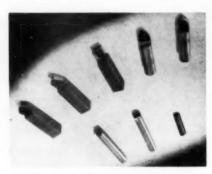


Grinding wheels are available for various materials including tungsten carbide, tool steel, machine steel, cast iron, brass or bronze, aluminum, Bakelite, hard rubber, and soft rubber, with special cup wheels supplied for reamer and cutter grinding. Accessories available include diamond dressers and spring stops for grinding straight and spiral fluted reamers and cutters.

T-8-21

New Boring Tools

A comprehensive line of 7 basic styles of standardized carbide-tipped BORING TOOLS, in from 4 to 6 sizes each and now available from stock at competitive prices, is announced by Carboloy Company, Inc., Detroit, Michigan. Five of these styles (3, 4, 5, and 7) represent additions to the previous standard stock line of round shank, square end tools, and comprise 2 types of round shank tools for 30° and 45° and 90° boring bars in six sizes each.



Styles 3, 4, 5, 6, and 7 have a primary clearance of 7° and a secondary clearance of 10°. All types and sizes are finish ground with a nose radius. Diameters of the new round shank tools (Styles 3 and 4) range from \(\frac{5}{16} \) fo \(\frac{1}{2}\) \(\frac{7}{2}\). All of these tools are available with tips of grade 831 Carboloy cemented carbide, for precision boring of steel, and Grade 883 for boring cast iron as well as non-ferrous and non-metallic materials.

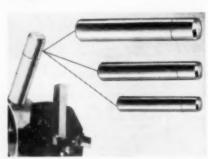
Square shank boring tools (Styles 5, 6 and 7) are stocked in shank sizes ranging from \(\frac{1}{2}\) to \(\frac{3}{4}\)", with sizes up to \(\frac{1}{2}\)" available in both the SS3 and S31 grades. The larger sizes are tipped with grades SS3 and 78, the latter designed for finishing and light roughing cuts in steel.

Styles I and 2 square end, round shank boring tools continue as formerly in shank diameters ranging from $\frac{5}{16}$ " to $\frac{1}{2}$ ". In addition, the line of stocked Carbolov boring tools includes round blanks for solid Carbolov boring tools, ranging from $\frac{3}{12}$ to $\frac{1}{4}$ " O.D.

T-8-22

Revolving Stop

A REVOLVING STOP, by Boyar-Schultz Corporation, 2110 Walnut St., Chicago 12, Ill., offers users of screw machines a free-turning, ball bearing head that reduces friction between work and stop and thereby prevents marring of work. Fully enclosed ball race prevents entrance of chips and other foreign matter, prolonging life of the tool. The tool is available in 3 diameters and 7 lengths.



T-8-23

Norbide Ekes Gage Life

Gage plugs, by the Size Control Division of American Gage Machine Company, 2500 Washington Blvd., Chicago 12, incorporate the almost unwearable Norbide. This gives the latest Size Control NORBIDE REVERSIBLE PLAIN PLUG GAGES 200 times the service life of old style, taper lock steel gages.



Norbide service life is further enhanced by the reversible plug feature of these gages, Plugs reverse quickly in a positive-locking, pin-vise aluminum handle, and this double life can be further increased by cutting worn tips and exposing new gaging surfaces. Complete data available in Size Control Catalog 47. T-8-24

Precision Locator

A new PRECISION HOLE LOCATOR, by the DoAll Company, Des Plaines, Ill., is so designed that holes can be located and drilled, on an ordinary drill press, to an accuracy approaching that obtained on a jig borer.

The DoAll Locator, as it has been named, consists of two arms of hardened and ground tool steel at right angles to each other within 30 seconds of arc. At the exact vertex of the right angle is a ground tapered hole in which hardened and ground drill bushings are held by a bridge clamp. A vernier stop slides on each of the arms, which are graduated from 6". The graduations of the verniers, which are machine engraved by precision methods, are easily set and read to less than .001".



The tool is very easy to use. To locate a center, two sides of the workpiece are used as reference sides, the two vernier slides acting as stops. When the slides are set to the required dimensions, and the Locator is placed on the workpiece, with the vernier stops against the reference sides, the center of the tapered hole is in the exact desired location. The Locator is then clamped to the work by inserting the ¼" precision ground drill bushing, and by using the special center punch furnished with the Locator, the desired center may be accurately punched.

T-8-25

Diamond Abrasive Drill

Designed to drill holes of any depth in all hard, brittle, non-metallic materials, the new Felker **DI-MET CORE DRILL**, by Felker Manufacturing Co., Torrace, Cal., is said to be 10 to 15 times faster than anything yet developed. Exceptional drilling speed is due to the novel method of supplying coolant, under constant pressure, through the drill stom to the special metal-bonded diamond abrasive rim.



Applications are numerous in drilling or coring glass, tile, concrete, porcelain, hard brick, ceramics, minerals, gem stones, marble, granite, and similar substances. Once seated, the drill travels in a straight line and holes of any depth can be drilled, being limited only by drill length. With care, unbroken cores of any length are easily produced.

T-8-2

Electrolimit Contour Gage

An **ELECTROLIMIT CONTOUR GAGE**, by *Pratt & Whitney*. Division of Niles-Bement-Pond Co., West Hartford, Conn., affords a fast and accurate means of checking the centerless cam contour of automotive pistons. A floating pressure shoe arbor, mounted on a slide, allows easy installation or removal of the piston being gaged. The arbor assembly rotates through an arc of 180°. Each of two Electrolimit heads, for indicating the cam contour, has a floating gaging point and a fixed pickup point.



When the piston has been mounted on the arbor through the piston pin hole with the piston skirt up, the arbor is slid into position for gaging and locked. The fixed pickup points contact the bottom piston ring land which has been ground to a true circle. The floating gaging points rest on the bottom of the cylinder skirt. As the arbor assembly with the piston is rotated 90° to either side of the center position, the meters indicate the variation in cam contour.

Multiple Drill Head

The United States Drill Head Company, Cincinnati 4. Ohio, is currently featuring the "US MULTIPLE ADJUSTABLE SPINDLE DRILL HEAD, which is suitable for mounting on any solutive drilling machine.



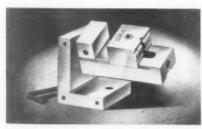
Various models mount from 3 to 8 spindles, within a 6" diameter drilling area, running in Oilite bearings and special heavy-duty ball thrust bearings. Universal joints, of the self-lubricated, heavy-duty aircraft type, are designed for quick change when necessary for replacement. Total weight, with 8 spindles, is 21 lbs.

Standard spindles have collets that take up to ¼" diameter shanks; however, spindles can be furnished with vertical adjustment, with ASA-299 taper, and single purpose collets such as used for chamfering or spotfacing. T-8-28

Vise and Angle Plate

The Sta-Ga-Co COMBINATION VISE & ANGLE PLATE, marketed by Gale Forssen Co., 64 Monmouth St., Springfield 9, Mass., is a compact unit which mounts at any angle desired, on end or either side. The reversible jaw is provided with flat and V grip. This versatile design of vise and angle plate permits its use in layout, jig boring, drilling and tapping, inspection, grinding, and light milling.

T-8-29

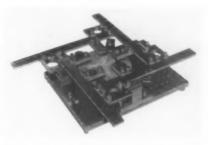


Low-Temp Welding Rod

A low-temperature (400° F.) WELD-ING ROD for zinc-base die castings, by All-State Welding Alloys Co., Inc., 96 West Post Rd., White Plains, N. Y., is now available in 3/32" diameter, round form. Suited to most applications and known as All-State No. 53, it is claimed to have a shear strength of 25,000 lb. psi., and to give a perfect color match.

Superior Speed Jig

The SPEED JIG, by The Superior Sales and Engineering Co., Cincinnati 2, Ohio, is made up of a number of basic but precision-made members that can be quickly assembled, into any variety of jig and fixture patterns, for the economical production of interchangeable parts calling for drilling and reaming in various layouts and in one or more planes.



The great flexibility of construction and application makes possible many other practical uses for the Speed Jig, including: a precision layout fixture; an accurate method for transferring hole locations: a master set-up for coordinating drill jigs; drilling sample stampings and castings; and as a temporary jig while heavy production jigs are being built.

T-8-31

Automatic Roll Selector

Inexpensive, 100% inspection of length and diameter of small precision parts such as roller bearings, dowel pins, or chain links is provided by the automatice, hopper-fed ROLL SELECTOR developed by the Sheffield Corporation, Dayton, Ohio. The selector, which will gage and segregate 3600 parts an hour, has a wide range of adjustments—7/32 to 31/32" diameter and 9/32 to 3" length—and gages to a tolerance of .0005".

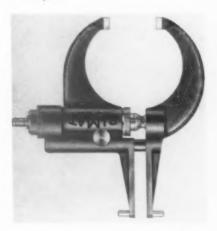


Parts fed into a hopper are picked up by a reciprocating device and delivered to the gaging position. One Electrichek gaging head checks the over-all length while two other heads check the diameters at each end. Each part is classified and segregated into one of four classifications—parts within tolerance limits, length oversize, diameter oversize, and either or both diameter and length undersize. Chutes pass the segregated parts into separate bins.

T.8-32

New Duplex Micrometer

Internal and external measurements are now possible with one "Rimat" DU-PLEX MICROMETER, a new tool in production at the Richards Machine Tool Company, 124 South Isabel Street, Glendale 5, Cal. Positive reading eliminates errors and makes for speed and accuracy on the job.



While the instrument is regularly made in three sizes: 0-1", 1"-2", and 2"-3", special sizes are available upon order.

A comparion tool to the Rimat Inside Micrometer, recently displayed in *The Tool Engineer*, the Duplex is precision made of the finest materials available. The ends of the measuring pins are hardened and ground on a radius for accuracy and to prevent cramping. All wearing surfaces are hardened and ground and can be readily adjusted should it become necessary.

T-8-33

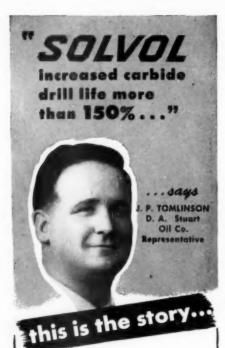
Small Rotary Work Table

II. P. Preis Engraving Machine Company, 157 Summit Street, Newark 4, N. J., offers a 5" ROTARY WORK TABLE especially designed for engraving, profiling, graduating, milling, and drilling on circular name plates, round dies, or any small work requiring circular or semi-circular cutting. Although primarily designed for use with the Preis pantographic engravers, the tool may be applied to practically any engraving machine.



The outer rim of the turn table is marked in degrees and numbered each 10 degrees. Every degree is notched, for quick and accurate division by engaging the index unit which, incidentally, can be disengaged for free turning, using a cam lock to clamp. The over-all height is 1%", weight 9 pounds.

T-8-34



"Using a competitive soluble oil, this manufacturer was getting from twenty to twenty-five holes per carbide drill, being used on angular crankshaft oil holes. The drills in many cases were seizing and flaking as they became dull. Production rate was very slow and cost per crankshaft much higher than they had anticipated. SOLVOL LIQUID CUTTING COMPOUND was put on the job at a twenty to one dilution. Drill life immediately increased to sixty-five holes per drill. Flaking was eliminated entirely. The production rate accordingly increased with reduction of crankshaft machining costs."

This actual performance report from Stuart's files provides additional proof that the *right* cutting fluid can make the difference between profit and loss on many metal-cutting operations. Put an experienced Stuart engineer to work on *your* cutting problems ... his service, supported by complete specialized laboratory facilities, is available for the asking.

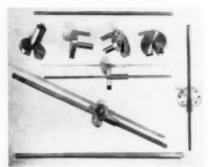
STUART service goes
with every barrel
WRITE FOR DETAILS



9797-49 SO. TROY STREET, CHICAGO 93, ILL.

Standardized Broaches

Standardized KEYWAY BROACHES (1/8 to 1/2" available from stock) are being supplied by Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio, for use on the Zagar 20" Horizontal Broaching Machine. By means of horntype adaptors which fit close into the pocket of the face plate, broaches are positioned to automatically cut to the proper depth. Described in Zagar Bulletin TE-3.



T-8-35

Universal Dividing Head

A model SD 6½" UNIVERSAL DIVIDING HEAD has been added to the line of the L-W Chuck Company, 45 S. St. Clair St., Toledo, Ohio. The spindle has a tapered bearing and the head tilts to more than 90° in vertical position. The dividing heads come complete with three index plates for up to 380 divisions.

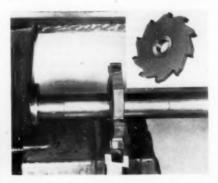


T-8-36

Bi-Axial Milling Cutter

Slotting jobs that have previously been too difficult for ordinary tungsten carbide cutters are now being handled, successfully by the BI-AXIAL, CARBIDE TIPPED MILLING CUTTER, developed by Super Tool Co., 21650 Hoover Rd., Detroit 13. Two axial rake angles and the negative rake on the blade result in automatic centering and absence of flutter. This eliminates side wear and makes possible holding to closer tolerances. Fully described in Super Tool Co. Catalog 47.

T-8-37



New Skid-Rol Dollie-

New "5-tonner" model SKID-1:01.

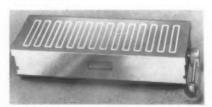
DOLLIES, with adjustable connecting bar for lighter loads than carried on their standard 10- and 12-ton units, are now available from Techtmann Industries, 714 West Wisconsin Ave., Milwaukee I, Wis. Safe and fast, these dollies will carry heavy freight, machinery, dies, and other equipment only a few inches from the floor, thus materially reducing the accident hazard. The extension bar, obtainable as extra equipment, is especially valuable to plants using standard boxes or skids for shipping. Inverted, the dollies will serve as rollers for girders or other heavy subjects.

T.8-38



New Magnetic Chuck

O. S. Walker Company, Inc., Worcester, Mass., developed a new PERMANENT CHUCK materially reducing weight and height. This new chuch, in the popular 6 x 18 size, now weighs 45 pounds less than the original design, and height has been reduced to 3-3/16" allowing more head room than heretofore obtained.



Both these salient features are supplemented by an increase in holding force by five per cent. In other words, it is a new 6" x 18" chuck weighing 90 pounds, only 3\%\(^{\alpha}\)_16" high, with an increased holding force. Similar improvements have been made in the 4" x8" and the 5" x 10" sizes. Complete specifications may be had in the "Permo Bulletin", published by the maker.

T-8-39

Self-Sizing Dowel Pin

A new type of **DOWEL PIN**, introduced by *E. A. Baumbach Mfg. Company*, 1812 S. Kilbourn Ave., Chicago 23, does away with jamming or sticking when being driven into the hole. It also remains tight and is easy to remove.



The pin is knurled on one end, hardened, and centerless ground to .001" oversize. The ground knurled end acts as a shear when being driven in.

T-8-40

New 1/8" Microgages

The Van Keuren Co., 176 Waltham treet, Watertown, Mass., announce an important improvement in their line of MICROGAGES. Microgages, which are recision gage blocks of round cross-ection, have been a popular item for many years because of their low cost and general utility for set-up work and inspection in the shop.



They are now made 7/8" in diameter instead of 11/16", resulting in a gage which has 60% more wearing surface and wringing quality. It also provides needed extra rigidity in the 2", 3", 4" and 6" blacks, which enables them to be produced with greater accuracy of size and squareness. The new microgages are available in 5-block, 7-block, 16-block and 35-block sets at no additional cost per gage.

The 35-block set giving combinations in ten thousandths from .300" to over 14" is shown in illustration. The 6" block finds considerable use and is not included in any other set of gage blocks on the market.

T-8-41

Dial Feed Table

A DIAL FEED TABLE, by The A. K. Allen Co., 3011 F. Hamilton Parkway,



Brooklyn 18, N. Y., operates on compressed air, entering through a three-way air valve, which moves a piston-actuated pawl arm. The pawl indexes the table and locks it until the valve is

released, allowing a spring to return the pawl ready for the next indexing. The locking mechanism automatically compensates for wear, adding to the life of the unit.

T-8-42

Jig and Fixture Unit

A new, compact JIG AND FIXTURE UNIT which may be widely applied is offered by Rapid Titan Mfg. Co., 634 Michigan Trust Bldg., Grand Rapids 4 Mich. A one-piece Cam-Wedge Nut, elongated to twice the screw diameter for normal thread bearing, permits automatic thread engagement and release. The tool operates in any position with push or pull pressure, as required.



Chuck Key Guide

From England comes the "HINTON PATENT CHUCK KEY GUIDE", designed to be fitted to keys all toothed sleeve chucks. It is made in all Jacobs sizes, slips on and off ensity and prevents skinned knuckles in addition to saving time. American distributors wanted. Address the Hinton Chuck Key Guide, Bailrigg Lane, Lancaster, England. T-8-44



Mounted Points by Norton

A handy kit of MOUNTED POINTS announced by Norton Company, Worcester, Mass., will be particularly useful for tool and die makers who need a variety of shapes and sizes. Designated as the Norton #16 Mounted Point Assortment, the kit is made up of one each of the 16 most popular sizes and shapes, all packaged in an ingenious box which serves as a rugged, sturdy shipping container and also as a handy holder on the bench while the points are in use.



Each point has its own individual location in the box, stamped with its number so as to facilitate reordering of any particular shape. There is also a card illustrating the complete Norton line of standard points, so that any other desired shape can be selected. The points are made of fast, cool cutting 38 ALUNDUM abrasive vitrified bonded and strongly cemented on steel spindles.

"606" Grade by Willey's

A new grade of WILLEY'S METAL, known as Willey's 606 and recently placed on the market, is universally applicable for machining all types of steel. Applications include the machining of such parts as axle shafts, worm gears, connecting rods and other parts made from tough forgings.

Said to outperform other grades by as much as 3 to 1, Willey's £06 can be furnished in standard tools, specials or blanks for those who make their own tools. Complete information may be had from Willey's Carbide Tool Co., 1340 W. Vernor Highway, Detroit 1.

T-8-46

Drill Speeder by Dumore

A new "DRILL SPEEDER", announced by the Dumore Company, Racine, Wisc., is a stardy self-contained, high speed electric drill, of 1/16 HP, that fits into the chuck of any standard drill press, lathe, milling machine, or specially designed machines and fixtures. Equipped with 3/8" straight shank or No. 2 Morse taper shank, the Drill Speeder supplies its own power and 17,000 RPM for drills from No. 80 up to 1/8" diameter.



Jacobs chuck and motor parts are accurately balanced so that small hole drilling can be performed at high speed with drill breakage reduced to an absolute minimum. It also provides the tool engineer an ideal means of quickly setting up for small production drilling jobs at the absolute minimum of cost.

3-Dimensional Miller

A new controlled Cut 3-DIMEN-SIONAL MILLER, by Philbro Tool & Die Company, subsidiary of Auto Engraver Company, Inc., 1776 B'way, New York 19, is so designed that fast, efficient contour milling, accurate profiling, and 3-dimensional engraving becomes a simple operation.



To mill a part to a certain shape or contour, a master template or model is made of brass, steel, wood, pastic, or plaster to the proportionate contours. The master is then traced with a stylus, the arm of which is controlled by the operator's hands. The vertical milling head or spindle follows automatically Also there is a hand-controlled vertical feed, to ½", which is particularly advantageous in 2-dimensional engraving and production profiling.

T-8-48

Taber Abraser Accessories

Three new accessories for use with the Taber Abraser in wear-testing a wide range of materials have been announced by Taber Instrument Corp'n. No. Tonawanda, N. Y.

The INTERVAL TIMER (right) provides an exact, electrical time control of abrasion tests and assures that the test will automatically terminate at the prescribed time limit permits laboratory personnel to concentrate on other work after the Abraser (left) once begins operation.



The DUPLEX REFACING STONE, which is mounted on the knurled platen, is designed to replace abrasive-conted paper discs for refacing Califrose-type abrading wheels. Its use provides improved control of wheel surfaces and better standardization of wheels.

ABRASER DRYMOUNT, a dual-control adhesive sheet (lower left) for use when weartesting thin, flexible fabrics or other similar materials, anchors the specimen to metal or cardboard backing to prevent wrinkling or buckling of the sample during test.

T-8-49

Air Arbor Press

Combining the features of both arbor and kick-type presses, the AIR ARBOR PRESS, by Air-Trol, 2653 W. Lake St., Checago 12, Ill., incorporates fast-action, spring-return air cylinders.



Two sizes are available, delivering a \$\textsup_4\$-ton or a \$\textsup_4\$-ton squeeze at \$1.50 lb, line pressure, with uniform pressure on each application assured by regulation of the air line pressure. When operated by foot control valve, which leaves both hands free for handling work, either model delivers a full stroke with less than one inch of foot movement.

T-8-50

New Floating Holder

Erickson Tools Division, 2309 Hamilton Ave., Cleveland 14, Ohio, has redesigned its ADJUSTABLE FLOATING HOLDER, for heavy-duty use on Brown & Sharp "00" automatics. Heavier flanges and adjusting screws provide greater wear and endurance, while rigidity, accuracy, and maximum clearance have been increased by reduction of overhand to ²⁷52".



The new holder uses the same collet as before, each with an over-all collapsibility of 1/32". The holder grips uniformly along the entire length of the collet, permitting good stubbing and prolonging tool life. Range is from ½" down to a No. 80 (.013") drill. T-8-51

Heavy Toggle Clamp

A heavy, **TOGGLE-ACTION CLAMP**—the Jumbo, by *Knu-Vise*, *Incorporated*, Detroit, is said to be the only big clamp of its type which permits spindle to be adjusted longitudinally along toggle bar



to accommodate various placements of work, at pressure point, without need for changing original location of clamp.

Operation is quick and effortless. With normal pressure on the handle, the clamp exerts a pressure of 1350 lbs, at the extreme end of the toggle bar. The design of the base,

comprising an integral front bracket and a back support, confines deflection at the spindle to not more than 3/16". T-8-52

Portable Electric Drill

A compact, lightweight and versatile portable production tool—THE CHIEF DRILL, Model 63—is now available from Chicago Precision Machine Co., 920 S. Michigan Ave., Chicago 6. Well balanced and equipped with a three-jaw Jacobs Chuck, with key, this tool will take drills up to ½" in steel and up to ½" in wood. Free speed is 2000 rpm.



T-8-53

Di-Acro Rod Parter

O'Neil-Irwin Manufacturing Compan 375 8th Ave., Lake Cicy, Minn., has intrduced a bench machine—the DI-ACRO ROD PARTER—for accurately cuttin or "parting off" round materials, on production basis, without distortion Numerous holes in the reversible cuttinheads, which are of heavy alloy tool steand easily changed, permit choice of cutting hole of exact size of the roal Thus, there is no loss of concentricity when parting material.



The Di-Acro Rod Parter is particularly emeacious for cutting extremely small diameter rods for delicate instruments requiring close tolerances as to length, squareness, and concentricity. Two models are available—No. 1 for ½2 to ¾3 round bar, and No. 2 for ½4 to ¾4 round bar, a precision, 3-way adjustable length gage quickly positions the rods.

High-Vacuum Furnace

A special HIGH-VACUUM FURNACE has been developed by Eitel-McCullough, Inc., 1570 San Mateo Ave., San Bruno, Cal., for the heat treatment of materials that are highly reactive toward gasses. Capable of continuous operation at temperatures in the 1800° C. region, the standard type consists of three chambers integrated into a single enclosed cubicle. Cycling circuits permit one chamber to be in the treatment phase, another under preliminary pumping, while the third is being reloaded.



Each chamber is equipped with a special high-speed oil diffusion pump capable of maintaining high vacuum during the most difficult outgassing operations. Program timers control the operating cycle and provide a means for presetting the treatment routing.

T-8-55

Airlectric Multichek

Inspections of numerous critical dimensions of automotive pistons, as well is eight classifications, are combined into one quick operation on the "AIRLEC-TRIC MULTICHEK" developed by the sheffield Corporation of Dayton, Ohio.

The operator merely loads and unloads the parts, accuracy of check being entirely independent of the human dement. Segregation into classifications is made possible by color stamping during the gaging cycle.



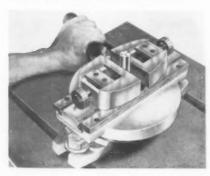
The rate of inspection and selection is between 500 and 700 pistons per hour, according to the efficiency of the operator. Pistons with undersize pin holes will not enter gaging position, and so are rejected at the start. With the piston in gaging position, simultaneous check is made of average diameter of pin holes at each of two bearings, diameters of four ring grooves, widths of five ring grooves and diameter of bottom skirt.

In addition, three classifications of pistons are automatically made on the basis of the average diameter of the pin hole, selections being made in steps of .0001" between minimum and maximum tolerance limits.

T-8-55

Double Cam-Actuated

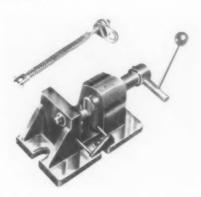
A DOUBLE-CAM-ACTUATED VISE, by The Williams Products Company, Middletown, Conn., centers the work to the drill or cutter regardless of the dimensional variation of the piece. This feature is of particular advantage in the case of castings, forgings, and similar types of non-machined blanks. When the cam lock is released, a 3" opening through the center allows work and chips to fall into a tray, for which clearance is provided under the fixture.



T-8-57

Kam-Grip Fixture

Designed primarily for production, a versatile MILLING FIXTURE, by Manufacturer's Engineering Service, Inc., 415-16 Security Bank Bldg., Toledo, Ohio, is equally adapted as a work holder for drill press operations. The tool is equipped with interchangeable anvils and movable jaws to accommodate a wide variety of sizes and shapes of work-pieces, and is further provided with a lock and release rod for automatic operation with air motors or other actuators. Fully described in a catalog folder, the fixture is a companion tool to the Kam-Grip Drill Jig previously introduced by this maker.



T-8-58

Post Units for Die Sets



PILLAR POST UNITS for Die Sets. by A. W. Grunow, Inc., White St. and Erie R.R., Orange, N. J., incorporates the Grunow phosphor bronze contractable bushings adjustable for fit and future wear. Because of the diamond bored special steel alloy housing, arcurate to a squareness of .0001" in 6", the maker claims a more accurate and smoother die set when these units are used. Descriptive literature, which includes full scale templates of the five sizes, may be had on request.

T-8-60

Electro-Mechanical Tester

Twenty-six inches of threads can be checked for lead errors in one set-up with the Model C Electro-Mechanical LEAD TESTER, developed by Pratt & Whitney, Division of Niles-Bement-Pond Co., West Hartford, Conn. Workpieces up to 10" diameter and 30" long can be held between the tailstock centers. Longer work, ranging from ½ to 3" diameter, can be checked using V-block work supports. Taper threads are checked in the same manner as straight threads and require no special set-up.



The measuring head is a standard P &W Supermicrometer Headstock, with a 1" spindle travel. The dial has 50 graduations of .001" each, with a vernier reading to .0001". The spindle subdivides any given inch along the work, while even inch increments are obtained by using precision end measures. With this equipment, lead readings can be taken between each individual thread quickly and accurately.

T-8-61

Hollow Shank Nib Taps

NIB TYPE M-11 TAPS coupled to hollow shanks, by Detroit Tap and Tool Co., 8432 Butler, Detroit 11, are particularly useful in tapping pipe couplings and other pieces where fairly long shank taps are commonly used to tap through several parts at a time.



When full, the tap is removed from the chuck to unload the parts. The tap itself is the well-known, M-11 cobalt-chrone high speed steel with a stub shank which is splined to fit the hollow shank. Use of the new hollow shank, which is 30% lighter, tap is more economical than the solid type, since only the nib requires replacement when worn.

T-8-62

The September number of The Tool Engineer will be devoted to the mammoth Machine Tool Show, to be held at the Dodge-Chicago Plant, Chicago, September 17 through 26, under sponsorship of the National Machine Tool Builders Association.

North East West South in Industry

Ch'f eng'r GEORGE A. CUSTER has been elected Vice-President in Charge of Manufacturing by Peninsular Grinding Wheel Co., Detroit. C. H. RICKEN-BACK, office and personnel mgr., has been named Ass't Sec'y.

THE CHARLES L. JARVIS CO., Middletown, Conn., has acquired the Dowding Div'n of the Henry L. Hanson Co. Facilities of the Dowding plant at North Attleboro, Mass., which has been producing taps and dies for the New England trade, will be extended to permit a national distribution. Utilizing the established country-wide Jarvis representation, sales of Dowding products will hereafter be directed from the parent company headquarters at Middletown.

ILLINOIS TOOL WORKS, Chicago, manufacturers of cutting tools, fastening products, and electronic heating equipment, recently celebrated its 35th anniversary with a dinner program for management, supervision, and veteran employees. Fifty men and four women, with 25 or more years service, were given special recognition.

E. G. BAILEY, vice-president of The Babcock and Wilcox Co., New York, will be 1947-1948 President of The American Society of Mechanical Engineers. His nomination at the semi-annual meeting of the society, June 15-19, in Chicago, assures his succeeding Eugene W. O'Brien, Atlanta, Ga., retiring President.

VITTETOW, INC., 1439 Detroit St., Denver 6, Colo., has been named exclusive representative in Colorado, Utah, and Wyoming for the Michigan Tool Co., Detroit manufacturers of gear production equipment.

ALBERT OLSON, gen'l mgr. of Dill Manufacturing Co. of Canada, Ltd. for 17 years, is now Engineering Assistant to the Managing Director of General Steel Wares, Ltd., Toronto, Ont.

The VULCAN NEW ENGLAND CO., 7 So. Main St., West Hartford, Conn., has been organized as an industrial consulting firm with Roger Tarpy, formerly ch'f tool eng'r for the U. S. Time Corp'n, as Managing Director.

FRANCIS B. FOLEY, Sup't of (metallurgical) Research for the Midvale Co., Nicetown, Pa., is slatted for the 1947-48 presidency of the American Society for Metals. His recent nomination is tantamount to election when the society convenes at Chicago in October.

The American Welding Society has announced the recipients of the 1947 A. F. Davis Undergraduate Welding Awards. First prize of \$200 has gone to JOHN W. PRICE, JR., Rose Polytechnic Inst., Terre Haute, Ind., for his paper "Atomic-Hydrogen Are Welding", published in the Rose Technic. Second honors and \$150 went to HOWARD SANDERS, Cornell University, Ithaca, N. Y., for "Welders in Diving Suits", published in the Cornell Engineer.

The 4th Annual SOUTHERN CALIFORNIA INDUSTRIAL EXPOSITION has attracted a very large group of national exhibitors in the machine tool field. Pacific Coast engineers will find the show well worth a visit. The exposition will be held August 16-24 at the Pan-Pacific Auditorium, Los Angeles.

VASCOLOY-RAMET CORP'N, N. Chicago, Ill., manufacturers of VR Carbide and Tantung tools, has appointed the following sales and service representatives: B. J. Naden, Cleveland, Ohio, J. M. Kinney, Toledo, Ohio, Frank Scheffler, Kansas City, and Dean R. Cline, Chicago. W. T. Fink, president of Form Products Co., Inc., Minneapolis, has been appointed Distributor in the Minnesota

A recent acquisition by THE CARBO-RUNDUM CO., Niagara Falls, N. Y., is the former assembly plant of the Philco Corp'n in Chicago's central m'f'g district. This will be remodeled to serve as Chicago sales offices, service center, and warehouse of The Carborundum Co. At Niagara Falls, the company's new Maintenance Bld'g is expected to be in use by January 1.

ARTHUR H. BAINTON, Gen'l Consultant of Brown & Sharpe Mfg. Co., Providence, R. I., and formerly works mgr., was kept busy on June 23, his 50th anniversary with the company. Throughout the day, he received gifts and congratulations from management, supervision, and employee groups, and was the guest of honor at luncheon and dinner.

The AMERICAN SOCIETY OF MET-ALS reports that its 1947 Metals Handbook will include a comprehensive section on carburizing of steel parts. Eight different articles have been written by the ASM Committee on Carburizing, composed of leading authorities in this field who have been working since 1940 on this project.

More than 100 manufacturers of instruments and devices for measurement, inspection, testing, and control have already taken exhibit space for the Second Annual Instrument Conference and Exhibit, to be held Sept. 8-12 at the Stevens Hotel, Chicago, under sponsorship of the INSTRUMENT SOCIETY OF AMERICA. Many new products will be shown, and engineers will find a visit to the show well worthwhile.

The 29th ANNUAL NATIONAL METAL CONGRESS AND EXPOSITION will be held October 18-24 in Chicago's International Amphitheatre, under sponsorship of the American Society for Metals. Meeting concurrently with that group will be the American Welding Society, the American Industrial Radium and X-Ray Society, the Iron and Steel Div'n and the Institute of Metals Div'n of the American Institute of Mining and Metallurgical Engineers. Admission to the Exposition will be by invitation only.

The ACME TOOL COMPANY has moved to its own building at 71 Wes Broadway, New York 7, N. Y. Expanded offices and warehouse facilities will enable them to better serve their customers needs for precision production tools.

Recent appointments made by H. K. Clark, President of The Carborundum Co., Niagara Falls, N. Y., include CLARENCE E. HAWKE as Director of Domestic Sales, EDWIN B. FORSE as Manager of The Carborundum Refractories Div'n at Perth Amboy, BOYD H. JOHNSON as Manager of Refractories Sales at Perth Amboy, and RUSSELL G. ALBERTSON as Manager of Canadian Carborundum Co., Ltd., Niagara Falls, Ontario.

A new electrical product group, known as the INDUCTION AND DIELECTRIC HEATING APPARATUS SECTION, and comprising eleven companies engaged in manufacture of apparatus for induction and dielectric heating, is announced by the Nat'l Electric Manufacturers Ass'n. Chairman of the group is Dr. H. B. Osborn, sales manager. Tocco Division, The Ohio Crankshaft Co. of Cleveland, Ohio. C. W. Miller, sales manager of the Industrial Electronics Division, Westinghouse Electric Corp'n, Baltimore, Md., is vice-chairman.

According to Dr. Osborn, the section was formed to insure greater benefits to users of high-frequency heating equipment, as well as the manufacturer, results best achieved through pooling of ideas. To best handle all technical aspects for the Section, a General Engineering Committee, headed by T. P. Kinn, manager of Industrial Electronics Engineering. Westinghouse, Baltimore, and including outstanding technical personnel in the high frequency heating field, has been established.

Also formed was a Federal Communications Commission Committee, to which K. E. Kjolseth, manager of sales, Induction and Dielectric Section, Industrial Heating Division, General Electric Co., Schenectady, N. Y., and J. W. Cable, director of research and development, Induction Heating Corp'n, New York, were respectively appointed chairman and vice-chairman. Another important arm of the section is the Statistical Committee, headed by Otto Weitman, vice-president of the Lepel High Frequency Laboratories, Inc., New York.

Other companies and their representatives affiliated with the section are Allis-Chalmers Manufacturing Co., Milwaukee, C. R. Dernbach, sales eng'r; Cutler-Hammer, Inc., Milwaukee, F. A. Wright, ass't general sales mgr.; Federal Telephone & Radio Corp'n, Clifton, N. J., George Lewis, ass't vice-president; the Girdler Corp'n, Louisville, Ky., Boyd R. Hopkins, sales mgr., Thermex Div'n; RCA Victor Div'n of Radio Corp'n of America, Camden, N. J., William G. Ellis, mgr., Industrial Electronics Section, Engineering Products Dep't; and Weltronic Company, Detroit, C. J. Collom, general mgr.

MULTIPLY the UTILITY of SURFACE GRINDERS



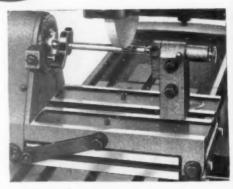
For dry grinding small cylindrical work, tapers and work requiring indexing, the new Brown & Sharpe Cylindrical Grinding and Indexing Attachment extends the usefulness of surface grinders. It saves time and expense and often makes unnecessary the installation of extra cylindrical grinding equipment.

Straight cylindrical or tapered work is ground between centers or if ½" diameter or less, can be held in the indexing spring chuck. In-

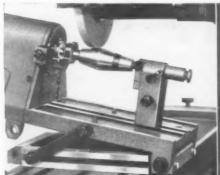
dexing is performed with headstock index plate or with interchangeable indexing spring chuck.

Centers swing 6" diameter, take work 5½" in length. Maximum grinding angle, 45°. 1/60 H.P., 115 V., A. C. motor is completely enclosed. Write for illustrated folder about the new time-and-money saving No. 616 Cylindrical Grinding and Indexing Attachment. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

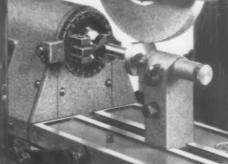
Visit our Booth No. 505 at the Machine Tool Show



 Grinding work held between centers. Tailstock center is withdrawn for work change by simple swing of lever.



Grinding taper shank. Attachment is adjustable to the desired taper.



Grinding parallel flats using index plate.
 Index plate has 24 slots and is locked or released by plunger.



 Angular grinding of work held in spring collet. Attachment is held on permanent magnet chuck.

BROWN & SHARPE



Use This Coupon for Complete Information on "Tools of Today"

For your convenience, every item appearing in the popular Tools of Today feature of The Tool Engineer is now keyed and further information easily obtained by checking the handy request form below.

Keep abreast of current developments-know what new tools are being marketed to increase production and step up efficiency-turn back now to the start of the Tools of Today feature for this month. Further information on any or all of the items shown can be obtained by circling the corresponding numbers on the form below, and mailing it to The Tool Engineer.

This month, sixty-two different items are described, covering every type of shop operation. Many of them are new products which alert plants will employ immediately to combat today's rising production costs. Others will be of tremendous help in attaining new heights of production accuracy. In every case, you will find "Tools of Today" worthy of your attention and an aid in keeping you abreast of the constant flow of new machines and appliances which are being placed on the market.

For your protection, "Tools of Today" items are checked and re-checked by the technical editors of The Tool Engineer so that performance data and other information will be accurate and dependable.

Tools of Today Department THE TOOL ENGINEER 550 West Lafayette Blvd., Detroit 26, Michigan

Gentlemen:

Please send me further information on the following Tools of Today items which I have checked:

T-8-1 T-8-2 T-8-3 T-8-4 T-8-5 T-8-6 T-8-7 T-8-8 T-8-9 T-8-10 T-8-11 T-8-12 T-8-13 T-8-14 T-8-15 T-8-16 T-8-17 T-8-18 T-8-19 T-8-20 T-8-21 T-8-22 T-8-23 T-8-24 T-8-25 T-8-26 T-8-27 T-8-28 T-8-29 T-8-30 T-8-31 T-8-32 T-8-33 T-8-34 T-8-35 T-8-36 T-8-37 T-8-38 T-8-39 T-8-40 T-8-41 T-8-42 T-8-43 T-8-44 T-8-45 T-8-46 T-8-47 T-8-48 T-8-49 T-8-50 T-8-51 T-8-52 T-8-53 T-8-54 T-8-55 T-8-56 T-8-57 T-8-58 T-8-59 T-8-60 T-8-61 T-8-62

Address



PRODUCTION DATA REPORT COUNTERBORES

WORK PIECE: Hardened steel sleeve insert in a stationary engine . . . 40 to 42 Rockwell "C".

OPERATION: Counterbore - smooth finish re-

quired. Soluble oil and water.

COOLANT:

MACHINE: Radial drill.

H.S.S. Counterbore. Wendt-Sonis Carbide Tipped Counterbore. (Straight flute de-sign.) Tool TAC-21. TOOLS:

COMPARISON

	H. S. S.	WENDT-SONIS
SPEED:	160 r.p.m.	420 r.p.m.
FEED:	.002	.003
RESULTS:	16 pcs. per grind	57 pcs. per grind
	114 pcs. per tool (average)	721 pcs. per tool (average)

Proof that this finer Wendt-Sonis Carbide Tool means more pieces per grind is found in this production data report. Better design eliminates chatter and gives a smoother finish. Straight flute design gives maximum performance on hard materials. Use Wendt-Sonis Tools to increase your production - combat high costs.

FREE! WENDT-SONIS CATALOG No. 646 Contains latest data, sizes and prices. Write: Wendt-Sonis Co., Hannibal, Missouri and 580 North Prairie Ave., Hawthorne, Calif.; also Wendt-Sonis Chicago Warehouse, 1361 West Lake St., Chicago, Illinois.

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS . CENTERS . COUNTERBORES . SPOTFACERS. . CUT-OFF TOOLS . DRILLS . END MILLS . FLY CUTTERS . TOOL BITS . MILLING CUTTERS . REAMERS . ROLLER TURNING TOOLS . SPECIAL BITS

City......State.....

MICROMATIC

QUILL-TYPE HIGH PRODUCTION HYDROHONERS

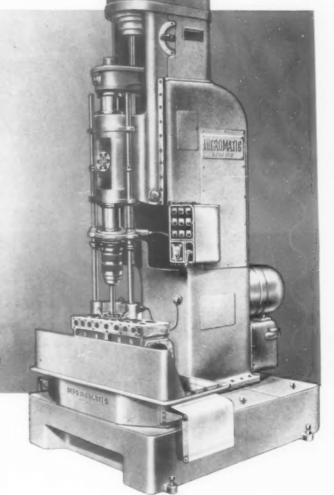
MODELS 723, 724 and 728

THESE new spindle-in-quill, unit constructed, hydraulically actuated, heavy duty Hydrohoner machines are designed for Microhoning bores from ¼ in. to 4 in. in diameter, in lengths from ½ in. to 9 in. in high production. When equipped with the latest electronic MICROSIZE control, uniform size is automatically and dependably generated within 0.0001 in. to 0.0003 in.

Important advantages are gained by the spindle being in the quill: torque and thrust are taken about the centerline of the spindle—guide bars are unnecessary—alignment is assured—the weight of machine parts reciprocated in stroking is substantially reduced—reciprocating speeds may be increased without added power input.

By combining spindle rotation speed control, stroke control, hydraulic control panel, and MICRODIAL mechanisms in the head unit, all mechanical linkages, hydraulic pipe and fittings, usually required are eliminated.

All electrical equipment is located for most convenient service and maintenance.



Specifications

	_		
Model	723	724	728
Work capacity, dialength	1/4 — 1" 1/4 — 6"	3/4 - 2" 1/4 - 8"	11/2-4"
Overall height x width x length	110x44½x60½"	127x44½x60½″	127x44½x60½
Base at floor, width x length	44½ x60½"	44½x60½"	44½ x60½"
Spindle recipro- cation stroke	0-7/6"	0-7/8"	10
Quill stroke Clearance— spindle to col-	10	12	12
umn Spindle nose to	10	10	10
pads, max Hydraulic oil	46	48	48
capacity	25	25	25
Coolant tank capacity	60	60	60



MICROMATIC HONE CORPORATION

DETROIT 4, MICHIGAN

MACHINES . TOOLS . FIXTURES . ABRASIVES

LOS ANGELES, CALIF. . HOUSTON, TEXAS . ROCKFORD, ILL. . NEW HAVEN, CONN. . BRANTFORD, ONT.

TOPS in TAPPING PERFORMANCE Auxil Downing

For maximum performance under tapping conditions prevailing in your shop, make your next tap order read "Jarvis-Dowding" . . . custom finished taps, designed to meet your demands. "Jarvis-Dowding"

TAPS AND DI

Taps cut more threads with less power, require minimum sharpening, and provide greater dependability on the job. A special hardening process under laboratory control adds a toughness that means longer life. Try "Jarvis-Dowding" Taps and see, feel, and figure the difference.

WRITE FOR BULLETIN JD-101

farvis power tools

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT Rotary Files • Flexible Shaft Machines • Taps and Dies Tapping Attachments • Quick Change Collets and Chucks



Shape-Form-Shear

... ON A "CINCINNATI"

Today Cincinnati Shapers are more efficient than ever before with heavier cutting capacities and speeds up to 200 strokes a minute on the 16"; and with a degree of accuracy that has never been excelled. Their power rapid traverse; multiple cam feeds; direct reading dials; and automatic oiling sell discriminating buyers. Coupled with these mechanical features are convenient controls; simplified adjustments; and means for quick and easy set-up, all of which please the operator.

Cincinnati Shapers are built in regular or universal type from 16" to 36". Ask for Cat, N-3.

See these machines under power at the Show



Cincinnati Press Brakes, the brakes of many uses, are today's machines for bending, forming, flanging, or multiple punching sheet metal. For easy fabrication, formed parts must fit; therefore accuracy is a fundamental advantage of these Brakes. Full-rated capacities; all-steel construction; built to withstand overload; deep bed and ram to avoid deflection are a few of the high points. These Brakes are built as accurately as a machine tool, and have unusual mechanical refinements.

Sizes to cover practically any requirement. Ask for Cat. B-2

See these machines under power at the Show



Cincinnati All-Steel Shears offer a new degree of accuracy in shearing sheet metal. They cut to tolerances that take a micrometer to measure; and shear with this accuracy at high speed. They shear a wide variety of material in both ferrous and non-ferrous metals. Hydraulic holddowns automatically clamp any gauge of metal with the same firm pressure; fine adjustments for the four-edge knives give more efficient use of the keen edge and longer life. Rapid, accurate gauging speeds up handling of the job.

Standard capacities of Shears range from 10 gauge to 11/4 inches. Ask for Cat. S-4.

See these machines under power at the Show



THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A. SHAPERS · SHEARS · BRAKES

Machine Tool Show

Booth No. 417

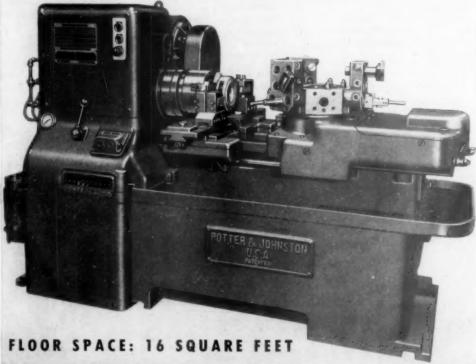
P & J AUTOMATICS will be Demonstrated in Action · Booth 43 · Machine Tool Show CHICAGO · SEPT. 17-26.

Split second timing

on change from rapid traverse to working feed, or vice versa

The new Potter & Johnston 3-U Automatic Turret Lathe highlights speed, accuracy and timing. P. & J. Automatics have time and again demonstrated their superiority over hand machines, and the new 3-U is no exception. Because of its speed and accuracy, cost per piece is lowered, in spite of greatly increased hourly pay for operators. The new 3-U has 48 changes of speed between 36-711 RPM and 73-1445 RPM, and these speeds are arranged in six sets of four automatic changes. Continuing on the subject of speed, this newest Potter & Johnston Automatic Turret Lathe has the power and speed demanded by carbide tooling; improved chucking arrangements give greater gripping power and quicker loading and unloading of work-and the machine makes a complete cycle of operations in 24 seconds! For quality of finished product and increased output at reduced labor cost, the 3-U P. & J. Automatic Turret Lathe has no superior. Its many qualities and the claims we make for it invite investigation, particularly if you are considering the selection of machines for the production line.





POTTER & JOHNSTON

MACHINE COMPANY

PAWTUCKET

RHODE ISLAND

Has Your Gage Supplier Told You about NORBIDE* Gages

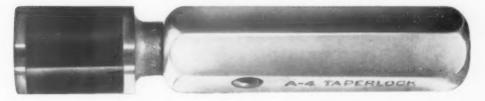
Are you being kept informed about NORBIDE Gages — the longest wearing gages ever made? Longest wearing? Yes, indeed, because they are made of Norton Boron Carbide — "the hardest material made by man." The extremely high resistance to abrasion of molded NORBIDE pieces has brought them into use for plug, ring, and keyway gages, contact points for dial indicators, anvils and spindles for snap gages and micrometers, and inserts for a wide variety of gages requiring wear surfaces. Furthermore, a NORBIDE piece is lighter than aluminum. It is chemically inertbeing unaffected by acids, alkalis or oxidizing mixtures. Its coefficient of expansion is only one third that of steel. This material is stable—it does not creep, work or season with age. It never loses its hardness and wear resistance. If your gage supplier hasn't told you how to save money by using NORBIDE Gages — the longest wearing gages ever made, then we invite

Norbide Division

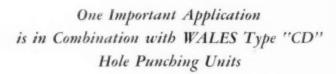
NORTON COMPANY
WORCESTER 6, MASSACHUSETTS

you to write to us:

"NORBIDE - Trade-mark Reg. U. S. Pat. Off.



WHAT COULD BE SIMPLER FOR HOLE PUNCHING THAN THE WALES PATENTED AND EXCLUSIVE TEMPLATE MOUNTING METHOD*



• Changing a setup of Wales Type "CD" Hole Punching Units with Patented Pilot Pins only requires removing the pair of operating templates from the press and replacing them with the next complete setup. With these templates, setups of Units are made outside the press and are ready to operate when bolted to die set. Press "down time" is only a matter of minutes. No adjustments are required between Units in the press.

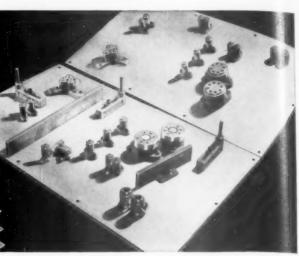
Uniform shut height of Wales Type "CD" Units provides an unlimited interchange of setups with only one ram adjustment.

PATENTED Wales Type "CD" Units eliminate the customary expensive and time-consuming methods formerly associated with building a die to punch a multiplicity of holes by:—eliminating special stripper plates, punches and dies...simplifying die design and die making...standardizing punches, dies and stripping mechanisms...reducing setup time...reducing investment in tooling inventory...reducing die storage space to a minimum...permitting setups to be made outside the press... reducing die maintenance costs by providing interchangeable parts for all standard units...releasing experienced die setters for other work...providing low initial costs.

Tooling with Wales Equipment is reduced to a simple, quick assembly operation.

The simplicity and economies of Wales Equipment are too BIG a story to tell on this page so write for fully illustrated, functionally-colored catalogs.

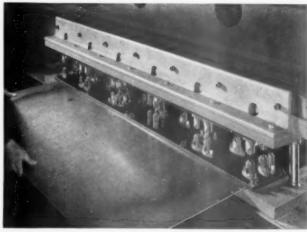
*NOTE: The Wales-Strippit Corporation has not granted permission to anyone to use this patented mounting method except with Wales Hole Punching and Notching Equipment.



A template setup of Wales type "CD" Hole Punching Units ready to be mounted in stamping press.



Showing a template setup of Wales Type "CD" Units in stamping press. Note the work in foreground.



Scattered, staggered and straight line hole punching patterns may be quickly, easily and economically put in operation with Wales Type "CD" Units mounted on templates

WALES-STRIPPIT CORPORATION

GEORGE F. WALES, President

393 PAYNE AVENUE, NORTH TONAWANDA, N. Y. WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO

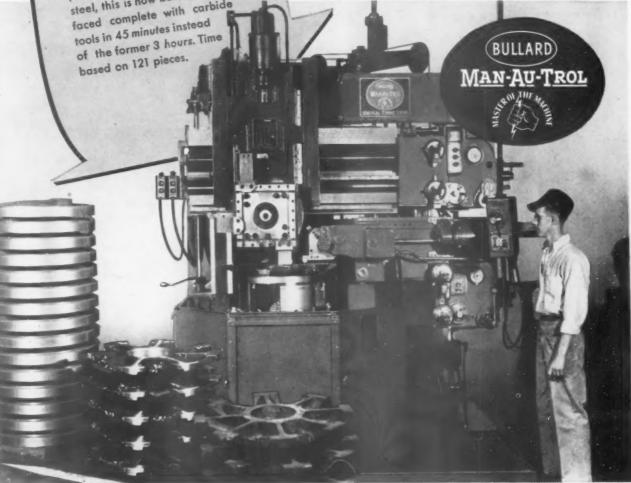
Specialists in Punching and Notching Equipment

BULLARD 36" Man-Au-Trol Vertical Turret Lathe is setting new production records for The McNeill Machine & Engineering Co., Akron 11, Ohio. For example: a crank gear blank of welded steel - O.D. 27.166" - which formerly took 4 3/4 hours, is now bored, finished and faced complete in 22 minutes in one setup except for the crank pin bore. Another with 28.500" O.D. is done in 27 minutes. All fractional dimensions held to 1/64" ... all decimal dimensions to .005". Time based on 500 pieces, produced two months ahead of schedule.

Another job (illustrated here) is steam platen support for tire and platen presses: made of 1045 cast platen presses: made of turned and steel, this is now bored, turned and faced complete with carbide tools in 45 minutes instead of the former 3 hours. Time

Crank Gear Blanks Machined 12 Times Faster on a BULLARD Man-Au-Trol V.T.L.

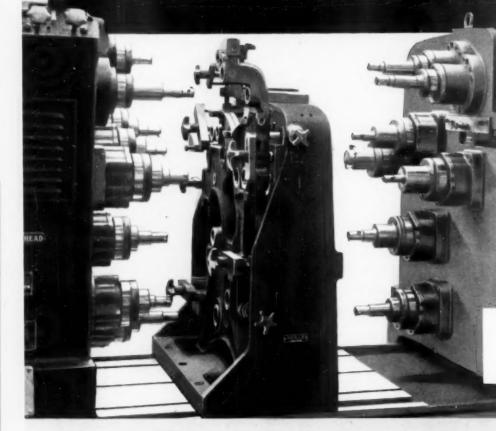
Investigate how the unique productivity, versatility and accuracy of **BULLARD** Man-Au-Trol Vertical Turret Lathes can give you substantial cost advantages in competitive markets. Write for Bulletin MAV-G-1 today. THE BULLARD COMPANY, Bridgeport 2, Connecticut.



BULLARD CREATES NEW METHODS TO MAKE MACHINES DO MORE

August, 1947

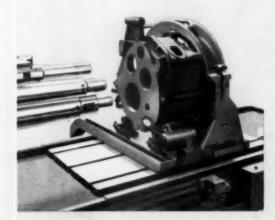
FOR MULTIPLE-BORING OF LARGE, AWKWARD WORK...



Finishing 13 holes in center frame of a textile machine. Size and cordal distance between holes are readily held to close tolerances with cluster type heads.

The Heald No. 45 Bore-Matic is the ideal machine

Baring, chamfering and grooving multiple holes in a transmission case assembly. Note accuracy gauge below work to assist operator.



AVAILABLE EITHER as a single or doubleend machine—and with as many as 15 boring heads—the Heald No. 45 Bore-Matic is designed specifically for boring large, hard-to-handle work. Built low to the floor for the greatest possible convenience in loading, it permits great accuracy in boring heavy cylinder blocks, pump and compressor bodies, large connecting rods, and the like. It can handle parts with holes up to 9" in diameter or with center-to-center distance of finished surfaces up to 33 1/2". Where the part has opposing holes, the double end machine assures extremely accurate alignment.

If you have large, heavy parts that must be machined to close tolerances, be sure to get all the facts on the No. 45 Bore-Matic. Get in touch with the Heald branch office nearest you, or write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

means more precision
...less cost

Branch Offices in Chicago • Cleveland • Dayton
Detroit • Indianapolis • Lansing • New York

INTERNAL AND SURFACE GRINDING MACHINES



BORE-MATIC PRECISION FINISHING MACHINES

CARBIDE-TIPPED TOOLS with HIGH-SPEED STEEL BODIES REDUCE PRODUCTION





Users of Carbide-Tipped Tools, brazed on hardened High-Speed Steel Bodies, have proven to their own satisfaction that, because of their higher cutting efficiency, they materially reduce production costs.

The high-speed steel body naturally provides a much harder base for the carbide tips, thereby reducing "spring-back" under heavy cuts.

Then too, the flutes and pilots, because they Rockwell C-62-63 throughout their entire length, do not score or pick-up, the pilot giving much longer wear.

The result is that Carbide-Tipped Cutting Tools with HIGH-SPEED STEEL BODIES give you smoother operation, longer tool life and reduced production costs. You get not only top-quality tools but also top-quality work.

Our engineers will be glad to work with you on your problems.

MADE TO YOUR SPECIFICATIONS

DETROIT REAMER & TOOL CO.

2830 E. Seven Mile Road

Detroit 12, Michigan

Manufacturers of Oil-Hole Drills, Subland Drills, Special Reamers, Circularity Relieved Reamers, End Mills and Special Tools





Spiral Shell End Mill with Carbide Tips.



Straight Flute Shell End Mill with Carbide Tips.



Taper Shank Core Drill with Carbide Tips.

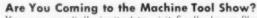


Taper Shank Straight Flute Reamer with Carbide Tips.



SUBLAND REAMERS
LINE REAMERS
CENTER DRILLS
COUNTERBORES
CORE DRILLS
END MILLS

Special Tools
To Your Specifications



lawndale 8770 for easy directions to the factory.

Make Quick, Accurate Adjustment ADJUSTABLE-ADAPTER-ASSEMBLIES

FAST and EASY as 1-2-3

O Release set screw in the side of

spindle. 2 Release screw in nut.

3 Shorten or lengthen projection

by turning the nut.

In multiple spindle drilling and tapping, save time and money; eliminate trouble and delays; adjust drills and taps fast and easy as One, Two, Three.

Set-up is not disturbed. Accuracy is assured as spindle screw retains the adapter in position, and key furnishes the positive drive. These adapters are carefully heat-treated and ground to assure concentricity.

For complete information refer to page 38, and 64 through 78 of Scully-Jones Tool Engineering Manual 500, or write for details.

MOST STANDARD SIZES ARE CARRIED IN STOCK FOR

Are You Planning SPECIAL TOOLING? If so, please send your drawings and specifications early. Prompt quotations will be made and delivery dates can be met, thus preventing delays in your production schedules.

1915 S. ROCKWELL ST. . CHICAGO 8, U.S.A.

SPINDLE EXTENSION ASSEMBLIES—Styles 1800 and 1900—Furnished with Morse Taper Holes and Acme Threads on the shanks.

TENSION AND COMPRESSION TAP HOLDERS-Styles "C" and "D" -Used on multiple and bused on muniple spindle tapping heads to compensate for variations in lead of different taps.

CHOICE OF TAPERS - Adjustable adapter assemblies are furnished with Morse Taper, turnished with Morse Taper,
"USE-'EM-UP" or Stub Taper
Holes. Acme Threads or Standard Threads on the shanks.

TYPICAL APPLICATION-of Scully-Jones Adjustable Adapter Type Assemblies. Close-up of work head and index table of a Special Multiple Spindle Machine, Manufactured by The Cross Co., Detroit, Mich.

to help you **CUT PRODUCTION COSTS!**

ONE OF MANY DIFFERENT TYPES: 75 ton Hannifin forcing press with built-in hydraulic power unit and "Sensitive Pressure Control".

Cut production costs and boost plant output -you can do it with Hannifin "JOB-TESTED" Hydraulic Presses! Hannifin offers standard and special types of presses for every purpose: straightening...press-fit assembling ...forming...molding-in capacities up to 150 tons. Built in a wide variety of open gap and two, three, and four column styles, complete with motor-driven pump and all necessary gauges and controls. Standardized designs for earlier delivery, lower cost. Quality construction for low maintenance, long life. Ask for a copy of Bulletin No. 60 -J.

HYDRAULIC job-tested

SUPERIOR DESIGN. Frames welded from steel plate and normalized before machining provide high strength and rigidity without excessive weight. Your choice of standard or special tables.

PRECISION-BUILT PRESSURE CYLINDERS. Cylinders TRU-BORED and honed to satin finish by exclusive Hannifin honing process. Tight-sealing precision piston rings insure maximum power with minimum need for maintenance.

ADVANCED CONTROL FEATURES. Everything you want for better, more accurate, more convenient operating control! Hannifin's exclusive Sensitive Pressure Type or arranged to meet the requirements of the operation.

ENGINEERING RECOMMENDATIONS. See your local Hannifin representative or write for complete information and recommendations. See HANNIFIN at the MACHINE TOOL SHOW, Booth 411—Chicago, Sept. 17-26.



 A single lever (hand or foot operated) gives operator complete control of ram movement and pressure
-thanks to Hannifin's exclusive "Sensitive Pressure Control"! Move the lever down slightly and the ram approaches work at "no pressure"...increase lever pressure, and ram pressure increases...release lever, and ram returns automatically to starting position.



Nationwide Sales and Service

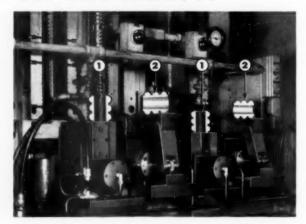
1101 So. Kilbourn Ave., Chicago 24, III.

. HYDRAULIC CYLINDERS . HYDRAULIC PRESSES AIR CYLINDERS PNEUMATIC PRESSES . HYDRAULIC RIVETERS . AIR CONTROL VALVES

2 OPERATIONS PER PIECE . . . 256 PIECES PER HOUR



And BOTH OPERATIONS ON ONE RAM...



Detroit Broach designed and built the tooling for both operations 1 and 2 to be mounted on one ram of the double ram broaching machine. The other ram is used to perform the same two operations on Bearing Caps of another size. One man operates both rams with ease.

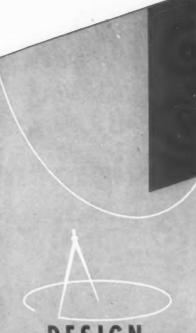
768 Main Bearing Caps per hour, finished on both sides...that's speed and economy hard to duplicate with any other method. And chances are that you can realize similar, even greater, savings by broaching some of your production parts.

As the country's largest exclusive manufacturer of broaches and broaching tools, Detroit Broach is well qualified through specialized experience to get the most for you from every broaching production-hour. We will help you to select your broaching operations and then give you cost and production data for each. It's a step toward beating today's high production costs.



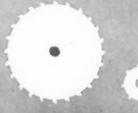
DETROIT Broach COMPANY

20201 SHERWOOD AVENUE . DETROIT 12, MICHIGAN



DESIGN

A complete engineering service, backed by an experienced staff, is at your service to make recommendations and design special cutters.



RANGE

Hundreds of sizes, dozens of models to meet every requirement, regardless of machines used or materials to be cut.



SERVIC

Even special tools use standard parts which are stocked by us. There are 20 Loveloy service centers throughout the U.S.A. — there is one near you.

30 YEARS' SATISFACTION

Nearly 30 years' continuous experience making milling cutters and other "Positive-Locking" rools. Our first customers are still buying our tools. All Lovejoy Blades for
Type A Milling Cutters
Type A Milling Cutters
are interchangeable from
are interchangeable from
4½ to 24" in diameter
4½ to 24" in diameter

LOVEJOY Type "A" Face Milling Cutters offer complete interchangeability of H.S.S., carbide and cast alloy blades in housings from $4\frac{1}{2}$ " to 24" in diameter. Thus you can take advantage of Lovejoy's prompt delivery of standard blades from stock—can eliminate the need for carrying large stocks of blades yourself. This feature, plus husky, forged steel housings, plus unsurpassed ability to remove metal quickly, accurately and smoothly, makes Lovejoy Type "A" mills outstanding for production economy.

The Type "A" blades are held in the housing with the famous Lovejoy "positive-locking" device. This means that a minimum of stock must be removed when sharpening. It allows utilization of a large per cent of each blade. It holds the blades immovably, even during heavy, intermittent cuts.

Type "A" face mills are available for all standard arbor and spindle mounts, and for either positive or negative rake cutting.

See these milling cutters and the rest of the complete, modern line of Lovejoy tools at the Machine Tool Show, Booth 153.

LOVEJOY TOOL COMPANY, INC.
SPRINGFIELD, VERMONT, U. S. A.

in Farm Equipment and Road Machinery

To meet today's demands for more and more farm equipment and road building machinery at the lowest possible costs, manufacturers are adopting broaching on a wholesale scale.

"UNIVERSAL HORIZONTAL"

Wherever you turn in this industry you will find Colonial Universal Horizontals, Colonial Pull-Up and Colonial Pull-Down machines turning out more parts at lower cost in less time.



for

SPLINES . KEYWAYS . HOLES . INVOLUTE FORMS . INVERTED KEYWAYS . HALF ROUNDS . AND ALL TYPES OF SURFACE BROACHING OF FLAT, ROUND AND OTHER SHAPES.



SPUR GEARS • BEVEL GEARS • WORM GEARS • HELICAL GEARS • RING GEARS • WHEEL HUBS • SLIDING CLUTCHES • BRAKE DISCS • FUEL PUMPS • CASTINGS • CONNECTING RODS • STEERING PARTS • SHIFTER PARTS • SELECTOR LEVERS • VALVE GUIDES • BALANCE CRANKS • PLOWSHARES.

Are you receiving "Broaching News"?



A BUYING GUIDE FOR ABRASIVES

POINT No. 7

SATISFIED USERS



When satisfied customers are the yardstick by which a concern is evaluated, The Carborundum Company measures up well. During the many years it has supplied abrasive tools to industry... the opinions, needs and viewpoints of those it serves have been deeply respected. The results of this policy are reflected in the high regard in which the name CARBORUNDUM is held by users of abrasives.

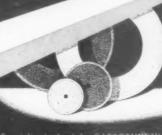
There's a certain feeling of satisfaction in doing business with a concern on this high level of helpful cooperation. It is often expressed in the stated preference for services and abrasive products by CARBORUNDUM. The Carborundum Company, Niagara Falls, N.Y.

CARBORUNDUM

TRADE MAI

BONDED ABRASIVES
COATED ABRASIVES

ABRASIVE GRAINS AND FINISHING COMPOUNDS



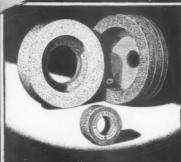
pecialized wheels by CARBORUNDUM for thread grinding



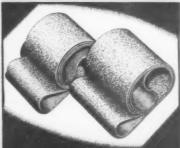
Diamond wheels to meet stiffer technical needs.



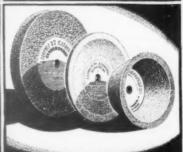
"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company



Cool-cutting green grit wheels for cemented carbide



A coated abrasive for every sanding and finishing condition

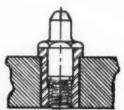


All standard shapes are supplied in grinding wheels by CARBORUNDUM









RETAINER & LOCATOR PIN ASSEMBLY

LOCATOR PINS RETAINERS **REST BUTTONS**





Four Types of Locators, Wide Range of Sizes. If You Have Not Standardized Your Locating Pins and Rest Buttons, Get

the Facts and Take Advantage of This Time-Saving Method.

When you standardize your fixtures, remember Q-C offers-

STANDARDIZED:

Rotary Index Tables Fixture Locks Rectangular Index

Tables Horizontal and Vertical Vises

Jigs and Fixtures

Jig and Fixture Units, Etc.

TYPE SI Q-C JIG-

May be mounted either vertically or harizontally.

This is only one of eleven types and over 1100 sizes available for your selection.

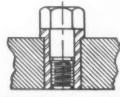
Only Q-C offers such a wide variety.

To Standardize t o Economize

Q-C ENGINEERING PRODUCTS

2842 W. Grand Blvd.

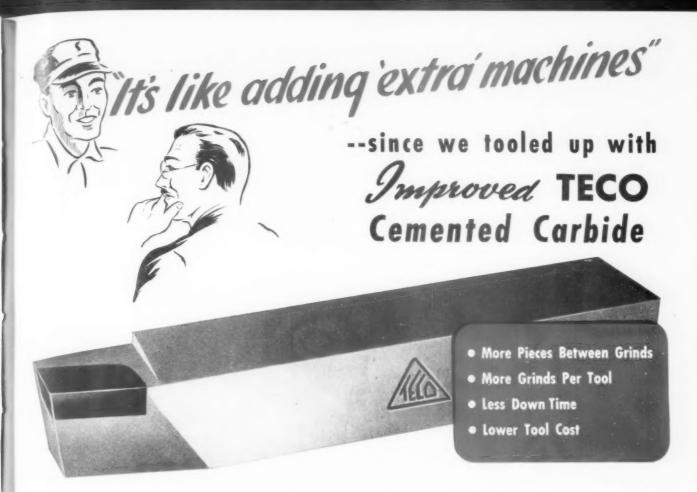
Detroit 2, Mich.



RETAINER & REST BUTTON ASSEMBLY



TYPE SI Q-C JIG The Tool Engineer



A TYPICAL CASE

Part: Carrier spindles
Machine: Bullard 30" V. T. L.
Material: S. A. E. 1045 Steel
Operation: Turning
—diameter 47/8"
—length 115/8"

Depth of cut: .010" to 3/s"
Feed: .021"
Speed: 230 ft. per minute

Pieces between grinds:
26 (no breakage)

Average number of grinds:
30 per tool (tip 1" long)

Best previous carbide:

7 to 8 pieces

I MPROVED TECO is setting new records of carbide performance in turning, boring and facing operations. Enthusiastic users continue to report production increases of 3 to 10 times over carbides formerly used. The case shown is a typical example of how a plant increased output per machine and reduced cost per piece simply by switching to Improved TECO. Chances are that you can make similar gains. It's well worth finding out.

Just do this! Tool up any regular carbide job with Improved TECO Cemented Carbide. Run under identical conditions. Then compare your pieces per grind—grinds per tool—pieces per tool—tool cost. Also note Improved TECO's exceptional performance at higher speeds and feeds.

Send us details of your machining problem for recommendation. Our tool engineers are glad to discuss your needs. Latest catalog and price list sent on request.

TUNGSTEN ELECTRIC CORPORATION 570 39th STREET, UNION CITY, N. J.

Branch Office: 403 Western Reserve Bldg., Cleveland 13, Ohio Representatives: Indianapolis, Ind., Detroit, Mich.

INTEROPER CO

CEMENTED CARBIDE

BENCH VISES . . . Ruggedly Built

A few advantages of ACME PRECISION VISES



PRACTICALLY IN DE-STRUCTIBLE—Head and Nut are Malleable Castings; other parts are semi-steel castings of high tensile strength.

SIDE TWIST PREVENTED by Precision guided steel key at base of the main body.

SPINDLE fitted into a horizontal sleeve nut—permits even, central pull—eliminates dead motion.

GROUND JAWS are replaceable.

Made in many sizes and types for light and heavy duty.



NUPLA MALLETS with Interchangeable Tips

- Will not mar or damage delicate painted, polished or plated surfaces.
- 2. No sting, vibration or rebound.
- 3. Will not "gash", mushroom or chip.
- 4. Not affected by oil or gasoline.
- 5. They are safety mallets-No explosion or fire hazard.

Equipped with NUPLOCK (Pat. Pending)—a dependable Tip-Locking device.

Nupla Mallets are made of a time tested material which gives them toughness, resiliency and self-healing qualities no other mallet possesses.

When ordering state grade

"S" Soft

"M"-Medium

"T"-Tough

Mallet No.	Head Dia,	Weight	Head Length	Price Each	Min
100	1"	5 Oz.	315"	\$2.00	6
105	1"	8 Oz.	315"	2.25	6
150	136"	34 Lb.	48.2"	3.00	6
155	115"	134 Lb.	43.	3.25	6
200	2"	134 Lb.	415"	4.00	6
205	2"	2 Lb.	41.5"	4.50	6
207	2"	3 Lb.	41.5"	5.25	4
250	216"	2 Lb.	58.4"	6.50	4
255	215"	4 Lb.	534"	7.50	4
300	3"	336 Lb.	63.5"	10.00	2
305	3"	6 Lb.	63.5	11.00	2
307	3"	9 L.b.	835	16.00	1
308	3"	12 Lb.	61.0"	18.00	1



PROMPT DELIVERY

Write for Bulletins

ACME

71 WEST BROADWAY

NEW YORK 7, N. Y.

Van Keuren THREAD MEASURING WIRES

STANDARD EQUIPMENT EVERYWHERE

Van Keuren measuring wires are the accepted standard equipment for making measurements on thread gages, taps, worms, splines and spur gears. We carry a complete stock of sizes for measuring U. S. Standard, Whitworth, Metric, British Association, Pipe, Acme and 29° Worm threads. Special wires of any diameter in the range from .002" to 1.5708" are made to order.

Our large supply of blanks insures prompt delivery. Van Keuren thread measuring wires are manufactured to National Bureau of Standards specifications. They are hardened, ground and lapped by precision methods developed over a quarter-century. They are accurate within .00002" for roundness and straightness and within ± .000025" for size. Special sizes are made to any tolerance required.

Keuren handbook—"Precision Measuring Tools" gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. Send for this valuable 144-page handbook No 33.



THE VAN CO., 174 Wo
Light Wave Equipment
Gauge Blocks • Taper
Plug Gages • Measuri

Light Wave Equipment • Light Wave Micrometers • Gauge Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Thread Measuring System • Shop Triangles • Carboloy Measuring Wires • Carboloy Plug Gages.



Precision CENTERED EYE Bending The DI-ACRO Bender

makes perfectly centered eyes from rod or strip stock at high hourly production rates. Both eye and center-

ing bend are formed with

one operation. Any size

eye may be formed within capacity of bender and ductile limits of material.

DI-ACRO Bender No. 1

With DI-ACRO BENDERS

DI-ACRO Precision Bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

Send for CATALOG

"DIE-LESS" DUPLICATING showing many kinds of "Die-less" duplicating produced with DI-ACRO Benders, Brakes and Shears.

Forming radius 2" approx, Capacity 15" round cold rolled steel bar or equivalent. Also Benders No. 2 and 3 with larger capacities.

"OIE-LESS" DUPLICATING

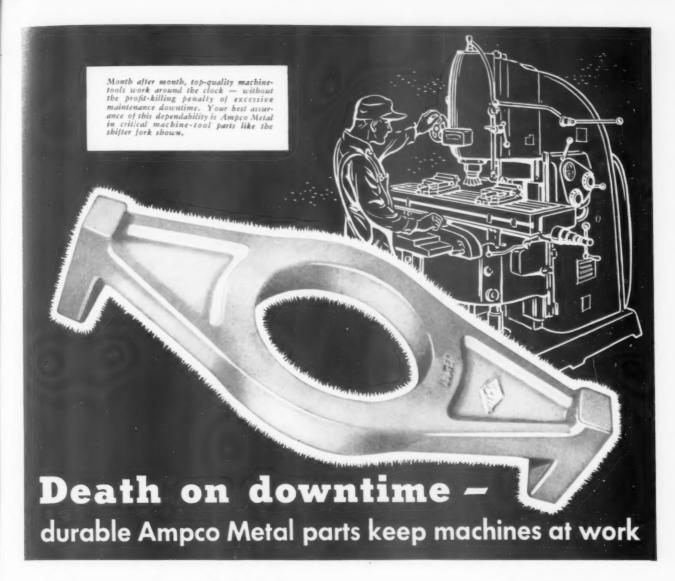




◆Pronounced "DIE-ACK-RO"

D'NEIL-IRWIN mfg.co.

375 EIGHTH AVENUE . LAKE CITY, MINNESOTA



This wear-resistant aluminum bronze reduces maintenance time and costs

There's no ceiling on the cost of expensive downtime, but there's good insurance against it—durable Ampco Metal in critical machine-tool parts. The extra wear-resistance of this modern aluminum bronze means longer and better service under extreme operating conditions.

Ampco Metal parts are a mark of quality to look for when you buy new equipment. Replace worn parts in your present machines with Ampco Metal to reduce replacement frequency in the future and slash your maintenance costs to a new low.

Ampco Metal is a superior aluminum bronze of closely controlled quality. Its exceptional resistance to wear makes it last several times longer than ordinary alloys of this type. Ampco Metal can be produced by centrifugal- and sand-casting, extrusion, or forging processes according to your requirements.

Let your nearby Ampco engineer help you select the proper grade for your needs, from the seven standard grades and several modifications available. For complete information, write for Bulletin 71.

Ampco Metal has 7 outstanding performance advantages—

Excellent béaring qualities • High strength-weight ratio
• High compressive strength • High impact and fatigue values
• Corrosion resistance • Efficiency at extreme temperatures.

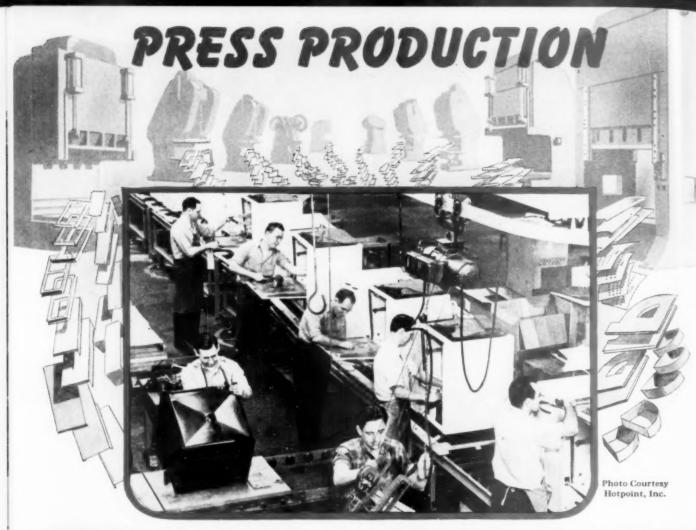
AMPCO Metal

Ampco Metal, Inc.

Dept. TE-8 • Milwaukee 4, Wis.

Field Offices in Principal Cities

AB-32



FEEDS THE ASSEMBLY LINE

The Assembly Line-symbol of American Mass Productiondepends on a rapid and constant flow of finished parts to each stage of the assembly.

Largely responsible for keeping the line moving, Presses provide the fast, all-around production of duplicated metal parts that modern standards of production demand.

Danly Die Sets-a necessary part of good Presswork everywhere-speed die making programs, protect costly dies, cut down time for regrinds. Danly Die Sets and Die Makers' Supplies are nationally recognized for known dependable accuracy.

DANLY MACHINE SPECIALTIES, INC. 2100 South 52nd Avenue Chicago 50, Illinois



National Assembly

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CLEVELAND 14 1550 East 33rd Street

DAYTON 2 990 East Monument ROCHESTER 4

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DUCOMMUN METALS & SUPPLY CO.



DIE MAKERS' SUPPLIES

DANLY DIE SETS

Welded Steel Fabrication





Only new bortz diamonds, carefully crushed and graded by the special JKS process are used in making Secomet wheels. Extra life and clean, sharp cutting action are thus provided.

Grit sizes of 400 and coarser are available in metal, resinoid or vitrified bonds to provide proper surface for all types of tools. 500 grit and finer can be supplied for special applications.

Bonds are selected for their ability to hold diamond particles securely until completely consumed.

Straight cup, flaring cup, dish and other wheel types meet every production requirement for diamond wheels.

For all the facts, write for Bulletin 45A.

Chambers St., New York 7, N. Y. 6400 Tireman Ave.. Detroit 4, Michigan

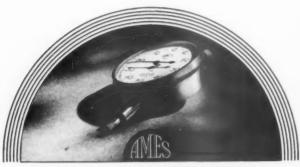
AT THE

PRODUCTION AND **MACHINE TOOL SHOW**

THE INTERNATIONAL AMPHITHEATRE CHICAGO, ILL. SEPT. 17-26th

GROB BROTHERS GRAFTON, WISCONSIN

CONTOUR METAL BAND SAWS CONTINUOUS FILING MACHINES FRICTION SAWS - BUTT WELDERS



WHEN MEASURING IS YOUR PROBLEM ...

AND your requirements combine high standards of accuracy, long service-life, and the greatest possible economy of operation—you'll find the answer in AMES' complete line of quality Micrometer Dial Gauges and Indicators. Instruments that are on the job the world over-solving the complex measuring demands of modern industry. Send us your problem today.

Representatives in principal cities B. C. AMES CO. Waltham 54, Mass.



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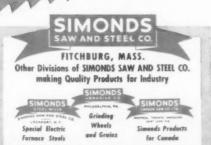
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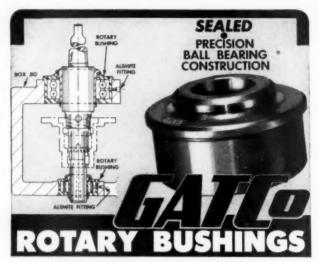
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with SIMONDS "Red End" BLADES

SECRET of straighter, smoother cuts and longer blade-life is ACCURATELY TESTED TENSION.

NEW SIMONDS SIMOMETER enables you to tension any size blade correctly in a matter of seconds . . . and so get top cutting performance out of the top brand of blades — SIMONDS "Red End".

SEE HOW SIMOMETER SAVES SAW-DOLLARS! A Simonds Saw Specialist will demonstrate — on your own hacksaw machines — this easy-to-read tension tester. NO OTHER METHOD LIKE IT. Just call your distributor or the nearest Simonds office.



FOR DRILLING, CORE DRILLING, ROUGH AND FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work-or both.

Eliminates expensive tool construction-Reduces tool wear-Prevents seizure and pilot breakage-Especially adapted where precision is required.

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GIERN & ANHOLTT TOOL CO. 1302 Mt. Elliott Avenue · Detroit 7, Michigan

"CONE-LOK" JIGS



The Woodworth "CONE-LOK" jig utilizes the full braking power of its perfectly mated male and

ACCURACY YOU CAN TRUST

- MECHANICAL SIMPLICITY
 ADAPTABILITY
- RUGGED CONSTRUCTION
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If you at times have difficulty in getting operators to make spindle alignments absolutely accurate in tapping or reaming, there's an easy way to end your troubles. Supply them with Ziegler Floating Holders.

SPINDLE MISALIGNMENT

By automatically compensating for inaccuracies in spindle alignment up to 1/32" radius, or 1/16" diameter, the Ziegler Holder insures perfect work in spite of carelessness on the part of the operator.

This is why the Ziegler Holder is coming into increasingly widespread use. You'll save yourself a lot of grief by changing over to Ziegler Holders for all of your tapping and reaming jobs.

W. M. Ziegler Tool Co. 1930 Twelfth St. Detroit 16, Mich.

'You're cordially invited-

at the MACHINE TOOL SHOW"

ECLIPSE will display its complete line of fine end cutting tools for your analysis. The booth is 603, north-east end of building... see you there.

ECLIPSE COUNTERBORE COMPANY

CORE DRILLS

INTERCHANGEABLE COUNTERBORES

COUNTERBORE SETS

INVERTED SPOT FACER

MULTI-DIAMETER CUTTERS

and special tools . . . Special holders and drives . . . Welch plug sets . . . Countersinks.

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DETROIT 20, MICHIGAN



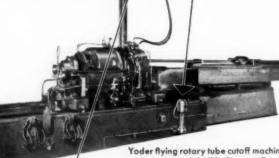
of service characteristic of

PIONEER PUMPS

Three machine tools of great length which depend upon PIONEER PUMPS for a reliable coolant supply and long, troublefree service.



Natco 3-way floor type machine relies upon a Pioneer VBA to cool and speed its operations.



Yoder flying rotary tube cutoff machine carrying a model VBD Pioneer Pump.



Colonial horizontal broach also uses a Pioneer Pump model VBA to send a uniform flow of coolant to the work point.

Pioneer Pump & Manufacturing Co.

of KALAMAZOO

TOOLS WHEELS

CARBIDE TOOL GRINDERS



HAMMOND

also makes General Purpose and Abrasive Belt Grinders • Automatic and Cylindrical Finishers • Polishing Lathes. Write for descriptive bulle-tins containing specifications.

Big grinders are "musts" for big tools. They pay for them-selves in faster grind ing, decreased tooldamage and reduced wheel wear. They relieve tool-room bottle-necks and help speed production throughout the plant. Good management cannot afford to overlook these economies.

HAMMOND CARBIDE TOOL GRINDERS

are made in 6" to 14" sizes for wet, dry, and Wet-ar-Dry operation, and for straight, cup, chip breaker and diamond finishing grinding. All are equipped with tilting tables and necessary angle gauges. Write for Bulletins.

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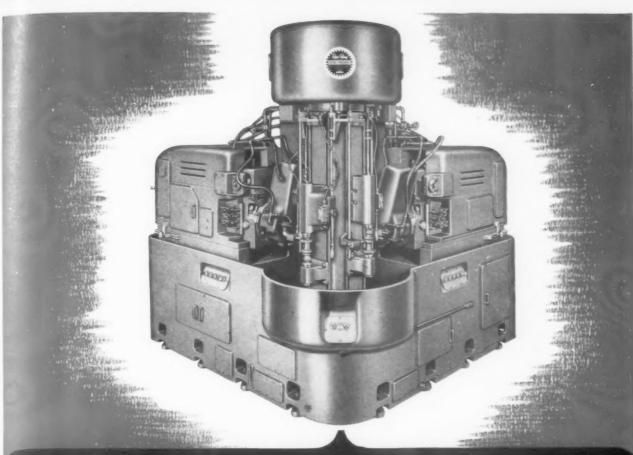
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ALLIS 14, WISC., U. S. A.



NEW High Production Machine SHAVES TWO GEARS SIMULTANEOUSLY



The new Red Ring Turmatic Gear Shaving Machine is built for fully automatic continuous operation and requires no skill of the operator whatever. He merely loads and unloads the machine. If he should make a mistake in loading a part or try to load an oversize part, the machine stops automatically to safeguard the cutters.

Production rates have been increased 250% plus. Motions in loading the work have been cut from 10 to 4.

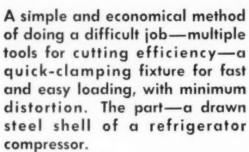
Either the conventional tooth form or the Elliptoid form can be produced. All movements are controlled electrically—no hydraulics. Write for descriptive bulletin on this new cost saving gear shaver.



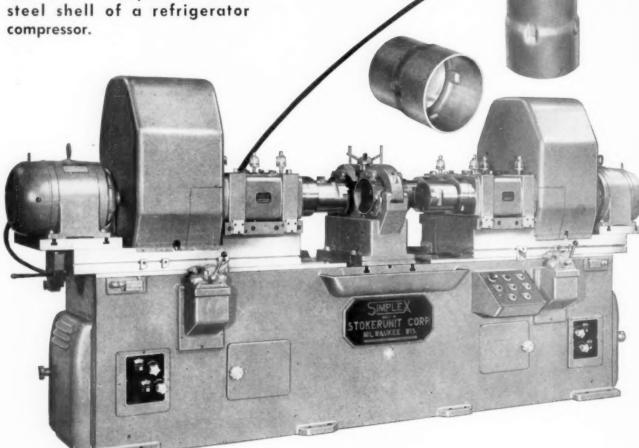
NATIONAL BROACH AND MACHINE CO.

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SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE . ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS



SIMPLEX



The machine shown is a SIMPLEX 3U 2-way Precision Boring Machine with four #4 boring heads, each carrying a multiple tool boring quill and an adjustable facing cutter. The parts are clamped in an equalizing fixture designed to hold the work securely with minimum distortion. Two pieces are bored and faced simultaneously, from both ends, reducing the cutting cycle to the time of the longest cut.

Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

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Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools

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THE OX TOOL CO., INC.

MATTHEWS

Steel Type ... Holders

FOR NEAT, EFFICIENT, ECONOMICAL MARKING

Whether your marking is in a straight or curved line or on a flat, concave or convex surface, Matthews Steel Type and Holders give legible impressions with perfect alignment and spacing. Type can be quickly and conveniently changed. Consult your nearest Matthews representative or write for Supplement A for full details.



THE TRIUMPH

Recommended for all stamping applications except high chrome or nickel alloy steels. Can be used interchangeably with type $^{1}_{16}$ to $^{2}_{16}$ inches in size.

THECHAMPION

For 90% of all heavy or medium duty marking. Type size up to ½ inch. made for any desired type capacity. Maximum recommended slot is 3 inches.



THE KING

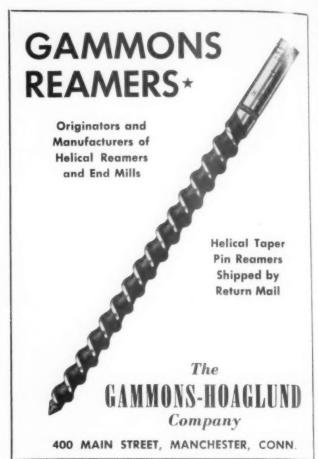
Compactly built for stamping small characters in a limited space. Type up to 18 inch can be used, with capacity to suit your requirements.

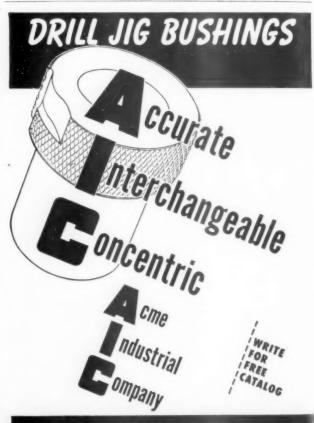
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Congoales of LATROBE the impact values of LATROBE

TABLE OF COMPARATIVE IMPACT VALUES

Unnotched	trod	Impact	(Foot	Pounds)

		omioiciea itoa impaci (rooi roonas		
Grade HIGH SPEED STEELS	Hardness (Rockwell C)	Latrobe's Dispersed-Segregate Steels	Standard Process	
Electrite No. 1 (18-4-1)	65.0	26.0	17.0	
" Vanadium (18-4-3)	65.0	29.0	14.0	
Double Six (6-6) DIE STEELS	65.0	39.0	27.0	
Select B (Medium Chrome, Air Hardening)	62.0	69.5	50.0	
G S N High Carbon-High Chrome, Oil Hardening	59.5	25.0	22.0	
Olympic (High Corbon-High Chrome, Air Hardening)	60.0	70.0	61.0	



2 booklets you should have!

Write for either or both of our new bulletins, describing Latrobe's Desegatized Brand of Dispersed-Segregate Steels—one on High Speed Tool Steels, the other on High Carbon-High Chrome Die Steels.

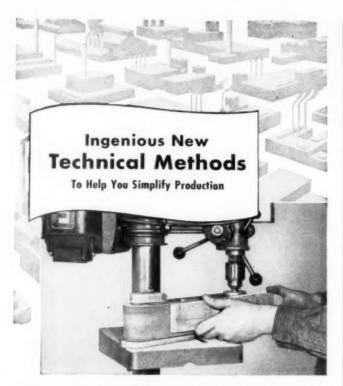
LATROBE laboratory technicians made countless tests, piece after piece, to arrive at the average impact values for the various grades of steels now available under Latrobe's exclusive DESEGATIZED Brand. Naturally, space does not permit showing all these grades, and the chart above shows a few typical examples. In all cases, however, these tests prove conclusively that:

STEELS FREE FROM CARBIDE SEGREGATIONS ARE EXTRA TOUGH, PROVIDING GREATER INSURANCE AGAINST TOOL BREAKAGE AND DIE FAILURES!

You can make sure of obtaining this superior performance by using Latrobe's DESEGATIZED Brand of Dispersed-Segregate Steels.



LATROBE ELECTRIC STEEL COMPANY . LATROBE, PENNSYLVANIA



NEW BELT SANDER FOR DRILL PRESS Does Finishing Jobs Faster, Better

A new, simple, faster method for many surface finishing jobs on wood, metal, plastic and other materials has been announced by the OK Specialty Com-pany of Chicago. The new finishing method takes the form of the OK Belt Sander, a drill press attachment.

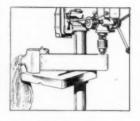
The new sanding device weighs less than 5 pounds. It is made up of an aluminum base with backing plate or platen, a driven pulley mounted on ground steel shaft and running on precision ground ball bearings, and cast aluminum driver pulley mounted on 1/2" ground steel shaft to fit into the drill press chuck.

The base of the sander is bolted to a drill press table. Merely by moving the Assembled, Ready for Action drill press table, the attachment can be adjusted to handle sanding belts from to 36" in length.

The sander takes belts from 1/2" to 3" in width. Two sanding belts, one coarse grit and one fine grit, are furnished with each attachment. The device comes as-sembled ready for use with any drill press. Most efficient performance is achieved at 3500 to 5000 RPM. The sander stands 5" high, and the base measures 10½" long by 3¼" wide.

Another time-saver on the job is chewing gum. Chewing gum may be used even when hands are busy; and under dust conditions helps to keep the throat moist—prevents "false thirst." For these reasons many plant owners make Wrigley's Spearmint Gum available to everyone.

You can get complete information from OK Specialty Company, 4655 N. Clark St., Chicago, Ill.

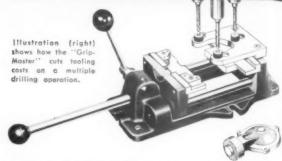


OK Belt Sander



AB-70

THE "WORLD'S FASTEST



Here's a SCREWLESS vise that provides a simple, ready-made base structure for drilling, tapping and assembly operations. Eliminates need for developing costly special jigs. Instantaneous, effortless setting makes Heinrich "Grip-Master" the World's fastest vise. Guaranteed, positive locking keeps work securely in place. Built-in bosses and removable parallels permit easy attachment of bushing plates and locating jaws. "Grip-Master's" large jaw openings and screwless operation makes loading and unloading a presto proposition.



NATIONAL MACHINE TOOL CO., Dept. 187-H, RACINE, WIS.



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5-PLUS FEATURES

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- 3 Less weight
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THREAD RING GAGES

No wonder more and more industries are adopting this gage as standard. Its revolutionary design assures wear life 5 to 7 times longer. And maintains accurate inspection. Just try the Woodworth Thread Ring Gage on your extra tough job-and you, too, will standardize!

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will do 85% of your machining jobs!

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Put these BESLY GRINDERS on for the machine tool show, chicago

The job can be ground better by BESLY

Whatever your grinding problems may be—however difficult they are—you'll go home with a notebook full of ideas after inspecting this latest in production equipment. In all types and sizes,

Besly Grinders provide maximum accuracy, output and economy . . . They're readily adaptable to an unlimited variety of jobs—at savings in time and labor that will help you cut manufacturing costs.

These Two NEW Besly Grinders will be shown for the first time



No. 320 Besly Wet Grinder. Fully Hydraulic. Operator places work in fixture, pushes a button and work goes through fixed cycle automatically.



No. 372—53" Besly Vertical Spindle Wet Grinder. 100 eighteen-inch diameter automotive Bell housings ground per hour. Flat within .003 inch.

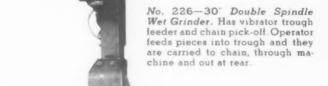
BESLY

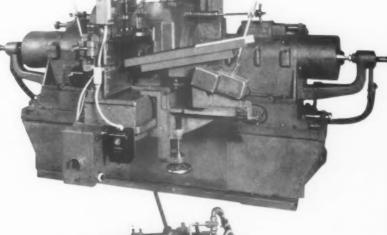
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OUT "MUST SEE" List ... EPTEMBER 17-26, BOOTHS 275-276-277



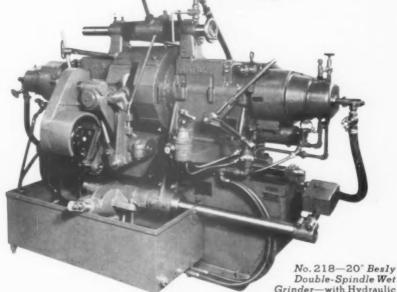
No. 902-12" Double Vertical Spindle Dry Grinder. Rotary feed. For grinding small coil springs, carbon brushes and similar pieces. Work is fed into openings in Rotary Feed Wheel; after grinding, pieces drop out by themselves.







No. 5-18-L Besly Direct Motor Driven single spindle Disc Grinder. Standard machine for light manufacturing or tool room use.



Double-Spindle Wet Grinder—with Hydraulic Feed. Side Driving Roll rotates work while it is being ground.

BESLY

В 5

CHARLES H. BESLY AND COMPANY . 118-124 N. Clinton St., Chicago G. III. . Factory: Beloit, Wis.

Good Example of
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on
CARMET CARBIDE

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For Extreme Vear Resistan

LET US MAKE IT FROM

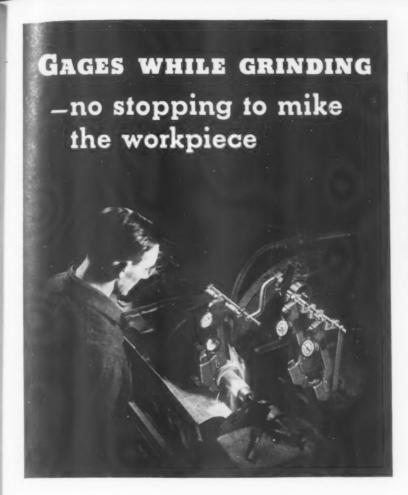
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Don't think of Carmet as just a complete line of cutting tools and blanks. We specialize in the pre-forming of statered earlies to solve parts problems of almost any size, shape of description—and we can supply these parts to you either "as formed" or finish-ground. • Let us go to bat for applications for the tremendous wear-resistance of Carbides—call for an Allegbeny Ludium Tool

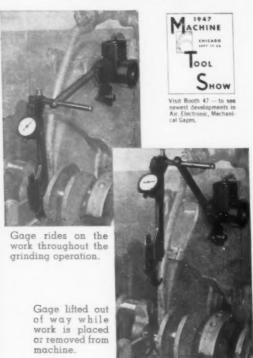


grand Ludium Steel

CARBIDE ALLOYS DIVISION, Ferndale (Detroit) Michigan



Increases production as much as 100%



Prevents oversize regrinds and undersize rejects

WHEN your grinding machine is never stopped to check the size of the work in process, your hourly output increases . . . the cost per piece decreases. That happens when you install a Federal-Arnold Continuous Grinding Gage.

This gage controls dimensions at the machine while the work is being ground. You put the gage on the rotating workpiece and leave it there; you do not hold it on the work; there is no stopping to mike or gage for size.

The operator requires no unusual skill or training; he merely watches the Dial Indicator until the piece is finished. When the Dial Indicator says the work is to size, it is to size.

Attach an Arnold Gage to a grinder and you see immediate results. You eliminate oversize regrinds and undersize rejects . . . save many a dollar otherwise lost in scrap. Even on short runs, this saving in scrap and the increase in output pay for your Arnold Gage in a very short while. Actual records show production increases as high as 116%.

This instrument is easily installed; is sturdily constructed to assure long life and continued accuracy. The contact points are made of tungsten carbide.

You can use Arnold Gages to check straight, tapered or splined diameters; widths between or over shoulders; combined diameter and width. Let a Field Service Man show you the

applications to your grinding operations. Write us for illustrated Bulletin No. 62.





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1144 Eddy St., Providence 1, R. I.

Dimensional Dial Indicators and Indicating Gages — mechanical, electronic, air, multidimensional
 Automatic Sorting
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 Machine Control
 Combinations of these methods.
 For the Mechanical, Textile, Rubber, Paper and all industries requiring dimensional accuracy.



This Grand Rapids No. 15 Motor Driven Hand Feed Surface Grinder can, in many instances, be used more profitably than the more costly Hydraulic Feed Surface Grinders . . . and we make both types.

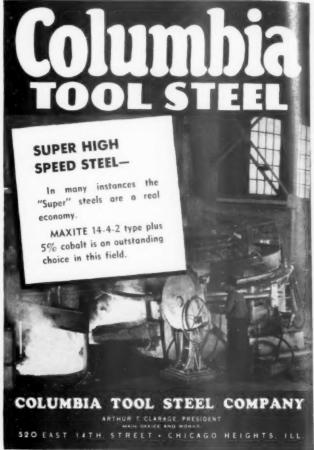
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GALLMEYER & LIVINGSTON COMPANY

Manufacturers of Grand Rapids Grinders 110 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

Designers and Builders of Hot and Cold Swaging Machines, Hammering Machines, Multiple Spindle Drilling and Tapping Machines, etc. Contract

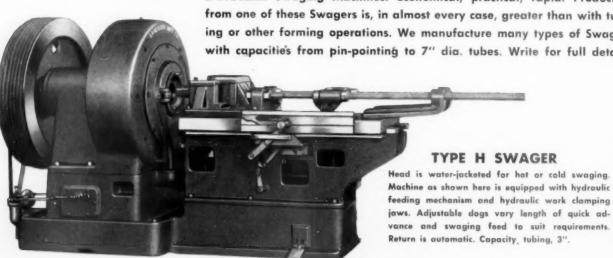
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The most practiced hand cannot judge to perfection the exact tension of every bolt or stud...by touch. That's why more and more particular craftsmen are using JO LINE torque wrenches. (Ranges to 1600 inch/pounds).

Wrench shown has 130 different instantaneous torque settings. All are accurate within 3% plus or minus 2 lbs. Break comes by automatic impulse, unerringly true to specifications. The perfect union of parts is speedily accomplished, even by the untrained. There are no dials to watch so the wrench may be used overhead, or in any position convenient.

Sturdily built, all torque control features are metal encased. No other wrenches in this class are as light in weight and as easy to handle as the JO LINE.

Catalog gives wrench specifications and complete line of adaptors. Tables of suggested torque values in various kinds of assembly are also given.

> "Precision tight Means it's right."

JO MANUFACTURING COMPANY 8442 OTIS ST., SOUTH GATE, CALIF.



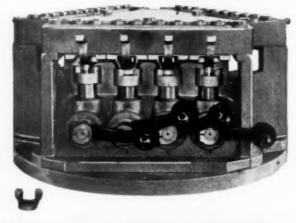
DE-STA-CO CLAMP Designed to Take 9

A new addition to the versatile De-Sta-Co family of production clamping tools. No. 464 Portable Clamp designed for sheet metal work. Positive toggle lock holds parts fixed for drilling, riveting, welding. Speeds assembly of ducts, housings, cabinets, auto bodies. Ideal for template work.

No. 464 Plier Clamp offers a firm hand grip for opening and closing. Jaws clear flanged metal edges. Adjustable for effi-cient pressures. Narrow nose for close spaces. Entire tool is torged and can be altered easily for special application. Replaceable hardened steel bushings minimize wear. Write for additional information on Model 464, or catalog No. 47 describing complete line.

De-Sta-Co clamps are stocked in principal industrial centers

DETROIT STAMPING COMPANY



THREE STATION INDEX FIXTURE FOR DRILLING HOLES IN UNIVERSAL JOINT YOKE. PARTS ARE CLAMPED AGAINST TOP PLATE IN ORDER TO CONTROL THE DEPTH OF MACHINED HOLES.

»» DESIGNERS «« »» BUILDERS ««

ALL TYPES OF HOLDING FIXTURES FOR MACHINE SHOP PRODUCTION

MANUFACTURERS OF STANDARD **SWARTZ DRILL JIGS AND FIXTURE LOCKS**

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SWARTZ TOOL PRODUCTS CO., INC.

13330 Foley

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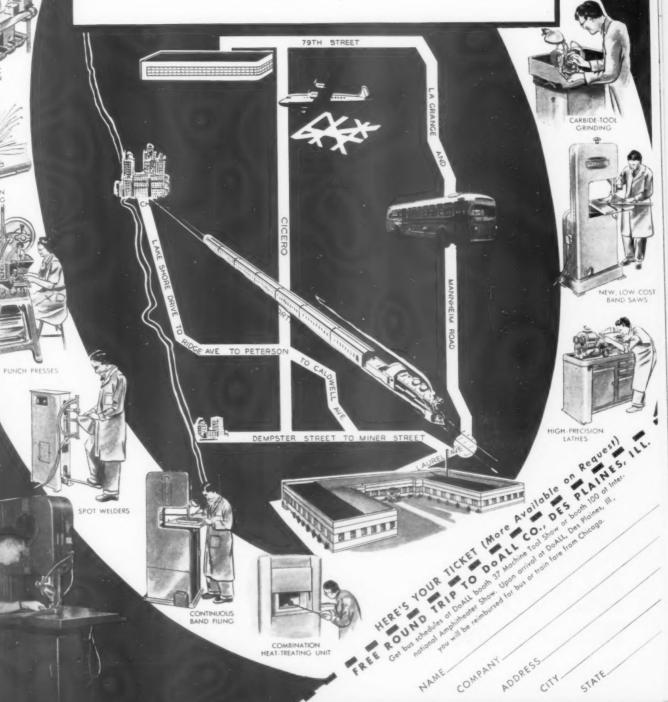
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"Root Relief"

REPUBLIC'S cleared major diameter of the ring gage permits the maximum number of resets and reworks at a minimum cost. REPUBLIC'S method guarantees that the relief will be centered in the thread root. Rings over \(^{7}\!s'' have a ground relief, which resists the adhering and wedging of dirt.

REPUBLIC'S rings with "THAT UN-SEEN EXTRA QUALITY" cost no more.

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Logan Quick Change Gear Manufacturing Turret Lathe

SPECIFICATIONS COMMON TO ALL LOGAN
LATHES...swing over bed, 101½"... bed length, 43½" ... size of hole through spindle, 25 32" ... spindle nose diameter and threads per inch, 11½" ... 8... 12 spindle speeds, 30 to 1450 rpm ... motor, ½ hp, 1750 rpm ... boll bearing spindle mounting ... drum type reversing motor switch and cord ... precision-ground ways, 2 V-ways, and 2 flat ways.

On specially designed machines the V-ways and flat ways of Logan Lathe beds are machined and then precision ground to within 0005" of parallelism. At every point along the ways carriage and tailstock are in precise alignment with the headstock, and movement in either direction is in a true parallel to the axis of the ball bearing mounted Logan spindle. Moreover, the Logan bed stays accurate. The specially alloyed casting is extra heavy, with oversize ribs and balanced sections of even thickness that neutralize internal stresses. Thorough seasoning before and between machining operations makes the bed warp-free. The Logan Lathe bed is another example of how advanced design and careful construction make Logan Lathes accurate and dependable in tool

room or on production line. Write for catalog.

LOGAN ENGINEERING CO. CHICAGO 30, ILLINOIS



CASC PRODUCTS CORPORATION - BRIDGEPORT 2, CONN.

"Batting Average

IN PRODUCTION AND PRECISION

With Kent Owens Milling Machines in your production line-up. .. you'll turn out more work ... with greater accuracy...and lower costs!

Shop men like the "feel" of these machines. Designed for rapid, easy set-up and operation. They've "plenty on the ball" in practical features, too! Efficient ... rugged ... dependable—assuring steady output without costly downtime.

In the Kent-Owens Standard line are a wide range of hydraulic and hand operated machines. Let a Kent-Owens engineer recommend machines and tooling best suited to your requirements. Write for details. Kent-Owens Machine Co., Toledo, Ohio.

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for Milling Machines

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NO 2-20



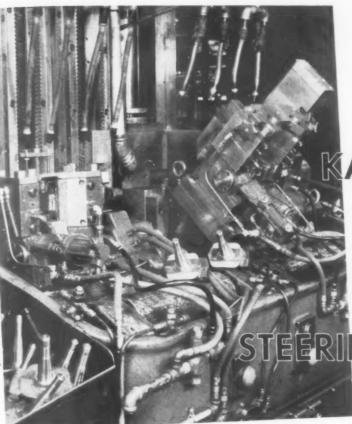
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FRANKENMUTH, MICHIGAN



MICHIGAN TOOLED MAISER-FRAZER

NG KNUCKLE

Broaches, Broach Holders and Pneumatic Fixtures were designed, built and followed in Production by Michigan

Illustrated is one of 4 machines equipped by Michigan. Shows dual ram set up with pneumatic fixture at left in operative position, fixture at right in loading position. 16 surfaces and the king pin hole are broached to final finish in five passes.

What makes this a story? Just that Michigan can do the same for you—start with the part print and machine and place the job in production.

Let Michigan quote on your next job

MICHIGAN WILL also DO THE COMPLETE MACHIN-ING OF YOUR PARTS

> Michigan is also equipped with the largest machine shop of its kind to machine and broach production parts for you.





10373 NORTHLAWN AVENUE

BROACH

SHELDON

TRB-S56 precision lathes



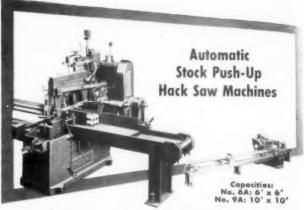
Production Capacity ---comes ready for production

The new TRB-S56 Sheldon Precision Lathes have the speed, stamina and capacity for general production use — 11½" swing, 1¾" hole thru spindle, 1" collet capacity. They will operate safely at high speed and work to the very closest tolerances, for spindle bearings are "Zero Precision" tapered roller bearings, the most accurate obtainable.

They will take a "healthy cut" too, because they have double V-belts to the spindle to assure full power from their 1 h.p. motor at the point of work. They come ready for production—no breaking-in period is required—start earning from the day received.

Write for Catalog of Sheldon and Sheldon-Vernon.

SHELDON MACHINE CO. Inc.
Munufacturers of Sheldon Precision Lathes - Arbor Presser Visco
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4229 N KNOX AVENUE - CHICAGO 41, ILLINO15, U.S.A.



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These automatic stock push-up hack saw machines are not new. MARVEL built the first practical bar feed hack saw machines, over 30 years ago. The sound, proven, basic principle of these machines has never changed—but they have been constantly improved and refined. Today they are still the leaders—the most practical, fastest, most accurate, most productive cutting hack saw machines built. No matter what your cut-off work, let us recommend the MARVEL saw that will give you true economy, speed and accuracy at an attractive price.

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"The Hack Saw People"

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Crossity Quality

Crobalt is a hard alloy (containing principally chromium, cobalt, tungsten, vanadium, zirconium and carbon), cast in the form of tool bits and inserted milling cutter blades especially developed for high speed production. At high temperatures (up to 2000 degrees) Crobalt cutting qualities remain constant.

The cutting edges of a Crobalt tool stay sharp longer, and thus assure you of much greater tool life between grinds. This automatically increases production by reducing "Down-time" ordinarily required for changing of tools. Try Crobalt in your shop.

CARBIDE TIPPED Inserted Milling Cutter Blades

Crobalt now fabricates carbide tipped inserted milling cutter blades. Any make of tungsten carbide can be furnished. Prices for this type of blade are unusually low and the product and finish are unexcelled. We manufacture blades of all types and sizes. Send us your prints for quotation.





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A steel for blanking, forming, drawing, trimming and shearing tools. Recognized as the leader in its field, PRK-33 has extremely long life in dies and is unsurpassed on quantity production runs. Simple to heat treat with uniform hardness penetration to the center and secondary hardness. Has high tensile strength and great resistance to abrasion.

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A Turning Tool with outstanding features that increase quality production and reduce down-time and rejections to a minimum.

Precision made from the finest steels, it is designed for very close tolerance work and made with the built-in strength to hold adjustments accurately through long runs.

An extremely easy tool to set up and adjust. After regrinding, the tool bit can be returned to holder in the same exact position with minimum lost time. The result-less downtime.

Available in 6 sizes, 000 to 3.

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Tool steel can be removed from tool bit holder, sharpened and returned to holder in the correct position with a minimum of down time.

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Model K Knurling Tool
n Three Sizes, 00, 0 & 2

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Model H Adapter Made in Six Sizes

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CONTOUR TURNS-AIR-TRACED

for accuracy at high speed

Nine diameters and seven contour rounds-all turned in less than one fourth the former time!

Can you use that kind of increased production? Of course you could-and so could an important railroad customer of ours. That's why they were so delighted with the performance of the Monarch Air-Tracer on this motor (car) axle job of theirs.

But machining time is not the only saving we're making for them. We've cut down on rejects-and we've improved finish and fit. Accuracy is an inherent feature of AIR-TRACING-and since operation is automatic, human errors are minimized.

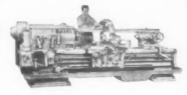
These advantages are equally available on a wide range of work-boring or turning contours, machining step shafts or ordinary production lathe jobs. For any work of this class you'll find the new Monarch Air-Tracer an efficient, versatile, economical attachment. Like more details? Ask for bulletin 2601.



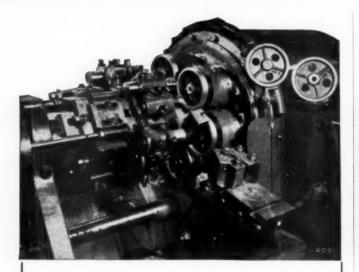


FOR SPEED, ACCURACY AND FINISH, THE MONARCH AIR-TRACER*

- 1. Stepless cutting-tool motion provides a superior continuous finish.
- 2. Setup times averaging five to ten minutes permit profitable use for a wide variety of small-lot produc-
- 3. Automatic yet versatile operation results in economical, accurate high production *Available exclusively on the new Monarch Lathes.



TURNING MACHINES



GEAR BLANKS ARE TURNED ACCURATELY AND SPEEDILY ON

"BAIRD" AUTOMATIC CHUCKING MACHINES

Here is shown a "Baird" No. 76H Chucking Machine, set up for turning, facing and boring gear Blanks made of a Special Cast Iron having a Rockwell hardness—85—90 B Scale.

The O.D. is finished turned to 6.800 plus or minus .001 and both faces are finished to 1.000 width, plus or minus .001.

The Hole is finished bored and reamed .750 diameter to plug gage and is concentric with the O.D. turning within .001 total indicator reading.

The work is held in Standard "Baird" Three Jaw Contracting Chucks, using stud type jaws for gripping. (The Spindle Turret is shown partially indexed to better illustrate the method of chucking.)

This gear is completely turned as shown to the required accuracy at the rate of 55 pieces per hour.

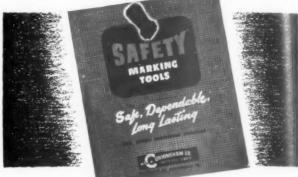
Selection of a spindle speed for each position, which is a special Baird Feature, permits high Spindle speeds in the finishing positions where carbide tools are used to produce the fine accurate surfaces required.

When you have Turning Operations that should be done profitably

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When dies are allergic to heat



Symptoms

- 1. Poor machinability before heat-treatment.
- 2. Cracking of corners and thin sections.
- 3. Formation of surface scale.
- 4. Distortion and dimensional change.
- 5. Low abrasion-resistance.

Prescription

B A-H (BETHLEHEM AIR-HARDENING)

Results

- V Good machinability.
- V Hardens in air from 1550 F. (Rockwell C of 61-62 after tempering.)
- V Keeps a clean surface.
- V Minimum distortion and dimensional change.
- V High abrasion-resistance.

Bethlehem Air-Hardening is indeed an aristocrat of die steels. It has proved the answer to many a perplexing die problem. Give it a trial on the next tough job and you'll appreciate its fine characteristics for high-production work.

TYPICAL ANALYSIS $\frac{C}{1.00}$ $\frac{Mn}{2.00}$ $\frac{Cr}{1.90}$ $\frac{Mo}{1.00}$

The nearest Bethlehem district office or distributor will gladly discuss your tool and die problems.

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B A-H...one of Bethlehem's fine tool steels

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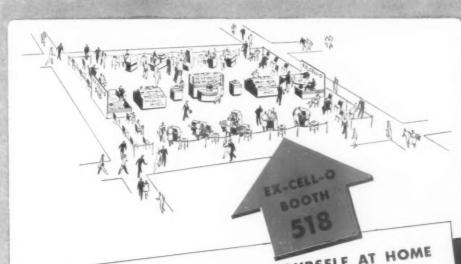
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ALGONAC, MICH.

(Algonac is near Detroit)





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A NEW TOOL ROTATING CHUCKING MACHINE

Fast Index, Power Chucking, Steady High Production

Featuring 1. A four-chuck horizontal indexing turret with three work spindles on each side. One position for loading. Rough and finish bore, face, drill or ream in the first two positions; finish ream or thread in third position.

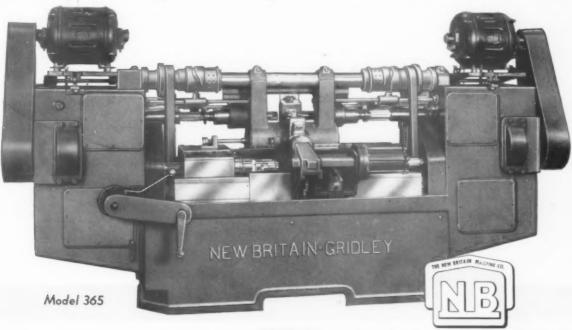
2. Over-all weight, power, and rigidity make possible the use of carbide tools and dampen any tendency to vibrate when running at high speeds.

3. Anti-friction spindles mounted in positionable quills carried in slides to minimize overhang. Spindle speeds up to 2,000 RPM have been provided for fast machining of non-ferrous metals.

4. Ease of operation. Loading position is waist high.

All controls within easy reach of operator. Automatic chucking quickly accomplished. Many types of pieces may be magazine loaded. Until fully inter-locked safety devices are satisfied, turret will not index nor tools jump.

5. High production. Rapid jump and drawback on all feeds. Total idle time of index - 1.67 seconds. Two pieces may be finished at one chucking on some jobs. Geneva motion index and locking mechanism completely enclosed and guarded against dirt and chips. Either lead screw threading or lead cam threading to take full advantage of self-opening dies or collapsing taps available in No. 3 position. Threading spindles may have different speeds and feeds and will reverse within closest limits on each successive cut.



We will have one of these machines in our Booth No. 311 at the Show. We will also have a complete line of six spindle automatic screw machines, four, six and eight spindle chucking machines, a precision contour turning and boring machine, and a new revolutionary turret lathe. We'll be seeing you September 17.



MEW BRITAIN

THE NEW BRITAIN MACHINE COMPANY NEW BRITAIN-GRIDLEY MACHINE DIVISION NEW BRITAIN, CONNECTICUT



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- 12 speed combination gear and belt drive headstock, 28-1800 rpm.
- 2. Single lever speed control, direct reading plate, guiding arrow.
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- 4. One-piece apron with positive jaw feed clutch and one-shot lubrication.
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- 9. Multiple Automatic Length Stops.
- 10. Deep steel chip pan.

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